Montana Department of Transportation

Performance Audit

of

Preconstruction Project Delivery

June 2000

Submitted to the

Montana Department of Transportation

and the

Montana Legislative Branch, Legislative Audit Division

LEGISLATIVE AUDIT DIVISION

June 2000

The Legislative Audit Committee
of the Montana State Legislature

Enclosed is a performance audit on Preconstruction Project Delivery at the Montana Department of Transportation. The audit was conducted by Dye Management Group, Inc., under contract with the Montana Department of Transportation. The Legislative Audit Division provided contract oversight including monitoring of the contract specifications and monitoring of audit procedures to ensure the work was conducted according to government auditing standards for performance audits. The comments and recommendations contained in the report represent the views of Dye Management.

The report presents recommendations to improve the efficiency and accountability of the department's preconstruction process. A response from the department is contained at the end of the report.

Respectfully submitted,

(Signature on File)

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Legislative Auditor

99P-04

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RE: Performance Audit of Preconstruction Project Delivery

Dye Management Group, Inc. is pleased to deliver this final report, which documents the Performance Audit of Preconstruction Project Delivery study noted above.

The purpose of the audit was to evaluate Montana Department of Transportation's (MDT) preconstruction project delivery processes in order to identify where the Department has opportunities for reducing the time and cost of delivery of preconstruction projects while maintaining quality. The audit process followed General Accounting Offices (GAO) standards for government performance audits and the Legislative Audit Division provided oversight.

Four distinct areas were analyzed in the audit: program delivery; project management and delivery, environmental process, and preconstruction survey. Overall, we found that MDT faces little risk of not delivering the program funded by TEA-21. We did find that significant time and cost efficiencies could be gained by strengthening the role of project management responsibilities, tools, and procedures within the Department; and several recommendations were made in this regard.

We would like to thank the office of the Legislative Audit Division for their quality assurance oversight. In addition, we would like to acknowledge the cooperation and time provided by the management and staff of MDT in providing data, participating in interviews, and providing valuable insight into the Department's preconstruction project delivery process.

With best regards,

DYE MANAGEMENT GROUP, INC.

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Performance Audit

Preconstruction Project Delivery

Montana Department of Transportation

Performance Audit of Preconstruction Project Delivery

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Executive Summary

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This executive summary presents the findings and recommendations from a performance audit of the Montana Department of Transportation's (MDT) preconstruction project delivery process.

A. Purpose

The purpose of this performance audit is to evaluate MDT's preconstruction project delivery processes to identify opportunities for reducing the time and cost of delivering preconstruction projects while maintaining quality.

B. Approach

1. Audit Areas

Four distinct areas were analyzed in the audit, as determined by initial issue identification interviews with MDT senior management and employees. The four study areas for the audit are:

- **Overall Program Delivery.** How well is MDT managing the overall preconstruction process to deliver the transportation program?
- **Project Level Analysis.** What is MDT's project management performance for preconstruction projects?
- **Environmental Process.** How well is MDT managing the environmental activities related to the delivery of transportation improvement projects?
- **Preconstruction Survey.** What is MDT's performance in preconstruction survey delivery?

To complete this audit and determine what areas should be examined in detail, as well as determine where MDT could make improvements to its processes and organization, several questions were posed and then answered through data collection and analysis. The results of the analysis provided answers to the questions and also indicated areas for improvement.

2. Quality Assurance

In order to maintain the highest standards of quality and independent review the following steps were taken:

- The audit was performed according to the United States General Accounting Office (GAO) guidelines as presented in the Government Auditing Standards: 1994 Revision.
- The performance audit received independent oversight and quality assurance review from the Montana Legislative Audit Division.

3. Audit Methodology

To meet the objectives of the review, our approach included a set of tools and methodologies designed to reach beyond perceptions and carry out quantitative and qualitative analyses that are based on fact. The following summarizes our audit approach:

- **Work with a technical advisory committee.** A technical advisory committee comprised of MDT preconstruction management and engineering staff provided input on data sources and perspective on findings. The committee assisted in collecting data; identifying performance indicators, resources, and interview partners; and providing the linkage to ongoing improvement efforts by different parts of MDT.
- **Clarification and definition of the questions to be answered by the review.** To ensure that the audit stayed focused and addressed the most important questions regarding preconstruction, the audit team received input from MDT management and the technical committee to precisely define the questions that would be researched and answered during the audit. This helped manage the scope of the effort and ensured that expectations about the products and results of the audit were defined and agreed upon at the outset.
- **Fact-finding interviews in all MDT districts and headquarters.** Interviews of preconstruction project delivery staff at headquarters and in all five districts (including designers, design supervisors, Area Engineers, Engineering Services Supervisors, District Administrators, and right-of-way and survey supervisors, and environmental engineering staff) to evaluate management controls, accountability structures, organization, and procedures for project delivery.

  All interviews were conducted with a structured interview guide that ensured consistency of the information gathered. The interviews were used to identify data and information sources, identify and determine issues that should be addressed by the review, and provide a control mechanism to ensure that data and information used in the analysis were reliable and relevant.

- **Review of existing documentation on procedures, rules, standards, and regulations.** The team collected and reviewed all documented policies, procedures and other guidance material available to MDT managers, staff, and contractors.
- **Collecting and analyzing data.** MDT maintains a variety of data related preconstruction projects in a number of different systems and documents. For this review, data from the following sources were used:
  - Statewide Transportation Improvement Program (STIP), the Montana Redbook, and other planning documents produced in the past three to five fiscal years.
  - Project Management System (PMS) and Detailed Ledger cost accounting data for Federal Aid projects let in fiscal years 1997/98 and 1998/99.
  - Statewide Budgeting and Accounting System (SBAS) and Cost Accounting Record Entry System (CARES) accounting system records for the past five years.
  - Phase Review and Letting Review meeting minutes.
  - Human resource data.
  - Construction Division change order information.
- **Measuring MDT's performance against a set of performance measures and benchmarks.** To determine the performance of MDT's preconstruction project delivery process, we used a series of performance measures designed both to confirm good practice within MDT and identify opportunities for improvement. This included MDT-specific performance measures and measures based on research and current practice elsewhere.

C. Program Delivery

Program delivery findings and recommendations are summarized in Exhibit E-1.

Exhibit E-1: Program Delivery Findings and Recommendations

Question	Findings
1. What are the overall trends in program delivery?	• Since 1996, MDT's construction program has steadily increased. It has risen by $60 million. – Since 1996, the value of projects let for construction has increased. – State funds are increasingly used to provide the match for federal funding. – The number of state funded projects has remained fairly consistent but their value has fallen. – Since 1996, the value of contracts let for new construction/reconstruction, resurfacing/minor widening, and bridge projects has doubled. – New construction/reconstruction and bridge projects account for most of the program growth. • MDT has made gains in productivity to deliver an increased program.
2. How well positioned is MDT to deliver the program funded by TEA-21?	• MDT is well positioned to obligate Montana's available federal funds based on: – MDT's FY99 performance. – The dollar volume of design work in PMS. – The increased use of design consultants. – Senior management focus on project delivery.
3. Is MDT delivering what it says it will deliver?	• Based on dollar value, MDT delivered just over 50% of the planned program for 1998 and 1999. • In 1997, MDT delivered 70 percent of the STIP, but this fell to 53 percent (measured in construction value) by 1999.

Question	Findings
4. Does MDT have effective procedures for managing consultant design projects?	• The number of consultant-designed projects has increased significantly. – The Consultant Design Section workload has increased. – MDT has strengthened the procedures, controls, and management of design consultants.

Recommendations
II-1 Establish a set of strategic department-wide management objectives, performance measures, and regular reports for project delivery. • Report progress against objectives to customers and senior management. • Tie achievement of these objectives to management and employees' performance plans. • Use objectives to provide leadership, set cultural direction, and to provide accountability to customers. • Use regular reporting to provide focus and accountability across functions, districts, and other units.
II-2 Improve the project delivery planning and management level reporting systems. • Establish and update project delivery plan monthly for all projects. • Track delivery, expenditures, and obligation of funds on a year-to-date basis. • Update plan periodically, based on PMS schedule changes. • Report year-to-date delivery by funding category and planned delivery.

D. Project Level Analysis

Project level analysis findings and recommendations are summarized in Exhibit E-2.

Exhibit E-2: Project Level Analysis

Question	Findings
1. Are MDT preconstruction projects delivered on budget?	• Analysis of planned versus actual labor hours shows that design activities are on budget, environmental activities are under budget, and survey and right-of-way activities are significantly over budget. – Design activities are performed in budget. – Survey activities are highly over budget. – Right-of-way activities are over budget. – Environmental activities are under budget. • Management controls, reporting, and accountability structure for preconstruction budgets need strengthening. – Line managers do not use budget to manage individual preconstruction project delivery. – Senior management does not track and monitor preconstruction budgets as part of project delivery management. – There are limited financial management information systems for preconstruction project delivery.

Question	Findings
2. Are projects delivered on schedule?	• It is not possible to evaluate the original project duration versus the actual duration for preconstruction projects. However, analysis from STIP delivery, Phase Review, and Letting Review meetings indicates that a sizeable percentage of projects are not delivered on their original planned schedule. – The project management system does not retain original schedule information. – STIP delivery, Phase Review, and Letting Review meetings indicate some schedules are not met.
3. How long is it taking to design projects?	• Analysis of preconstruction project delivery time indicates significant opportunities for reducing delivery time. There is a wide range in the length of delivery time. • There are controls in place to ensure that project priorities are consistent.
4. Are projects delivered within scope?	• Yes, MDT appears to be excelling at managing scope. For 108 projects analyzed, the variance between engineer's estimates at PFR and award amounts was $2.1 million out of $267.8 million. • MDT has in place effective scope management controls.
5. Is the letting schedule stable?	• Many projects have letting date delays and the letting schedule does not appear stable.
6. What is the quality of the work performed and is quality built into the process?	• The quality of design work is high, the number and value of design related change orders is very low, 1.0 percent of $172 million in construction. • Quality is built into the design process through reviews, procedures for constructability, review, and feedback to design during construction.

Question	Findings
7. What causes schedule delays? Which activities cause delay and add cost to the design process?	• A large proportion, 31 percent of projects analyzed, experienced a gap in preconstruction work of six or more months. • It is not clear-cut which activities cause delay. • Preconstruction survey causes schedule delay and adds cost. • Environmental and right-of-way activities are consistently late in the Right-of-Way Phase. • The traffic engineering review function performed in Helena is viewed as causing bottlenecks in project delivery.
8. Does MDT have efficient and effective management controls, accountability structures and organization for project delivery?	• MDT's organizational structure for project management has evolved but needs to go further, strengthening the role of project managers. - Project management responsibilities are fragmented across functional areas and districts. - MDT has elevated the project management function through updated position descriptions but still has a fairly weak project manager structure. - The project management culture is focused on schedule for design work; it needs to be broadened and strengthened to address budget, scope, and quality. • The district preconstruction interviewees are often unclear about the preconstruction project delivery plan.
9. Does MDT have the necessary tools and procedures for managing preconstruction project delivery?	• The current Project Management System is limited in its effectiveness as a project management tool. • Procedures, policies, and tools can be further enhanced to strengthen project management. • Districts are not always clear on current policies, procedures, and standards set in Helena, as they often are changed.

Recommendations

III-1. Elevate the importance of project management by establishing a strong matrix management approach for project delivery.

- Take the organizational steps to establish a strong matrix management approach for project design management. This should include bridge, roadway, consultant design, and other applicable "design projects".
- Make these project managers accountable for schedule, budget and scope for all phases from preliminary field review through to the delivery of final road plans.

III-2 Strengthen project management culture through:

- Communicating management objectives and providing program delivery status reports to line managers.
- Including achievement of project delivery objectives in performance plans of line managers in the Engineering Division, Environmental Unit, and Districts.
- Providing periodic training on MDT's project management approach.
- Providing communications and training on procedures, policies, and tools that support accomplishment of project delivery objectives.
- Facilitating the exchange of information on approaches and initiatives that improve project management performance.

III-3. Address bottlenecks arising from traffic engineering review function currently performed in Helena. Assess potential for shifting some design decisions to project managers.

- Establish single points of contact for traffic review for each district.
- Review staffing requirements of traffic review unit.
- Identify where authority for design decisions can be provided to project managers (Helena and districts).

III-4. For complex projects, prior to preliminary field review, establish a project team approach for project delivery involving all the applicable MDT disciplines, and external agency and organization representatives.

III-5. Strengthen the procedures and tools that support project management.

- Conduct expedited improvements to the Road Design Process and PMS flow chart, activity descriptions, and procedures. (These revised business roles can be used as part of requirements definition work for the new project management system).
- Develop a project delivery management and procedures manual that: incorporates changes, specifies roles and responsibilities, provides checklists, and details products or outcomes for each activity.
- Ensure that policies, procedures, and standards as updated are always current and implemented in the districts.
- Provide on-line updates to policies, procedures, and standards.
- Ensure that districts are alerted to changes in policies, procedures, and standards.

Recommendations
III-6. Improve the monitoring and management accountability systems for project delivery through: • Establishing preliminary budgets for all projects, tracking, and reporting budget to actual expenditures. • Providing a management tool that includes resource management scheduling for managers to use. • Including budgets for state funded projects in the PMS. • Strengthening procedures and systems for project cost, scope, and schedule control. • Holding project managers and management accountable for cost, scope, and schedule variances. • Reporting changes in scope, cost, and priority and providing an approval mechanism.
III-7. Prepare for and implement a new project management system. • Define requirements based on implementation of prior recommendations. • Ensure that product has true multi-project resourcing capabilities. • Select project management application. • Implement selected application.

E. Environmental Process

Environmental process findings and recommendations are summarized in Exhibit E-3.

Exhibit E-3: Environmental Process

Question	Findings
1. Are MDT environmental functions causing delays to the preconstruction process and letting schedule?	• Late environmental activities are pushing back ready dates and causing delays to the preconstruction schedule. – Many environmental activities are scheduled by PMS late in the development of a project. – Between October 1998 and September 1999, incomplete environmental documents or lack of permits caused 17% of letting schedule delays. • Environmental activities are scheduled late in PMS. • The accountability for environmental functions is disconnected from other project development activities causing schedule delay. • Changes to the preconstruction delivery plan, the letting schedule, and perceived uncertainty over the delivery plan contribute to delays in completing environmental activities. • Project delays after environmental approval create rework. – Over 11% of all environmental documents required for projects within the last two years required some additional analysis after the initial approval.

Question	Findings
2. Is appropriate time currently planned to complete environmental tasks?	• The majority of environmental activities in PMS are assigned more time than is normally required to accomplish them. – Only three projects out of 108 reviewed used within 10% of the planned hours. – There is little active "project management" for environmental activities; PMS durations are rarely overridden and PMS is not actively used.
3. Are environmental functions for preconstruction projects adequate to satisfy all necessary regulatory requirements? Is more being done than necessary to meet regulatory requirements? If so, what is being done and why?	• The Environmental Services Unit prepares high quality documents. • MDT is risk averse, and has set high standards for quality and thoroughness, and provides more, rather than less information, to obtain FHWA concurrence and meet environmental objectives. • MDT's environmental document review process has many handoffs. • Consultants are assigned a significant amount of environmental assessments and document preparation.
4. What are the requirements for timely public involvement input for preconstruction projects, and are they being met?	• MDT has developed a Public Involvement Handbook for project development.
5. What are the requirements for resource agency input for preconstruction projects, and are they creating a time variable outside of MDT control?	• Resource agencies create a time variable outside of MDT's project management control. • MDT management has provided leadership and supported initiatives with state and federal resource agencies to improve the efficiency and maintain the quality of the environmental process.

Recommendations
IV-1. Integrate project management responsibilities for environmental activities into the entire project design management process. • As part of establishing strong matrix management for preconstruction project delivery (see Recommendation III-1), make project managers responsible for the schedule and cost of environmental activities on projects. • Increase environmental engineers' accountability to project managers for schedule/activity completion. • Use environmental expertise as a resource to participate in design decisions. • Establish achievable durations for environmental activities.
IV-2. Ensure that PMS (or its replacement) is useful to, and is used by, the Environmental Services Unit for managing environmental activities. • Develop more accurate duration and work standards for environmental activities. Institutionalize the use of PMS data as a tool by environmental engineers. • Address environmental process requirements as part of Recommendation III-5.
IV-3. Make process improvements to the environmental activities in the preconstruction project delivery process that include: • Identifying key environmental issues early during Preliminary Field Review (PFR) so they can be responded to earlier without delaying the project. • Beginning environmental activities earlier as specified in the new consultant design procedures. • Providing applicable resource agencies with opportunity for early input. • Including resource agencies, where appropriate, as members of the project team for projects that will be developed using a project team (see Recommendation III-4).
IV-4. Standardize and simplify MDT's procedures for developing and approving environmental documents. • Delegate signing and approval of Categorical Exclusions to the District Environmental Project Engineers in the Environmental Services Unit. • Develop MDT standardized formats for both MDT and consultant produced environmental documents. • Establish MDT guidelines for undertaking Environmental Assessments. If more detailed analysis is needed do it as part of a Categorical Exclusion document. • Develop standardized procedures and report formats for resource analysis reports. • Develop a permit checklist for standardizing permit applications.

Recommendations
IV-5. Focus environmental engineers' work on providing support to preconstruction project managers. • Use environmental expertise as a resource to participate in design decisions. • Offer cross-training to increase MDT engineers' understanding of environmental issues and cost-effective design solutions that can avoid, minimize, and mitigate impacts. • Increase the efficiency and speed with which regulatory requirements are met without compromising MDT's commitment to environmental protection.
IV-6. Continue to work with state and federal regulatory agencies to: • Increase the efficiency and speed with which regulatory requirements are met without compromising MDT's commitment to environmental protection. • Improve external communication with resource agencies to encourage better understanding of respective agency needs and concerns.

F. Preconstruction Survey

Preconstruction survey findings and recommendations are summarized in Exhibit E-4.

Exhibit E-4: Preconstruction Survey

Question	Findings
1. Are preconstruction surveys delivered on budget?	• Preconstruction survey is significantly over budget. For 108 federal aid projects let between 1997 and 1998, actual labor costs were 96.6 percent greater than planned. • There is little project level accountability for, and management of, preconstruction survey budgets. • Survey technology has changed.
2. Are preconstruction surveys delivered on schedule?	• For many projects, surveys are not completed on schedule, resulting in ready date changes. Late surveys are a major factor in projects not being delivered on time.
3. Does preconstruction survey have effective management, organization and resources?	• Management controls and accountability structure for preconstruction survey need strengthening. • Managers of preconstruction survey do not use a budget to manage preconstruction survey delivery against at the program or individual project budget levels.

Question	Findings
	• Organizational reporting structure for preconstruction survey is not the most effective. • Management has issued a policy directive in response to schedule concerns. • Technical/software and training issues may be affecting survey productivity.

V-1. Establish management controls over schedule and cost for survey. • Establish work standards and budgets. Track and manage against schedules and budgets. • Measure and report survey costs. • Improve survey planning through accurate PMS planning values.
V-2: Provide project managers the responsibility and the authority for preconstruction survey. • Hold project managers and management accountable for cost, scope, and schedule variances. • Ensure project managers have authority and mechanisms to obtain survey resources where and when they are needed.
V-3 Expedite changes to the organization and reporting structure for preconstruction survey. • Fully implement planned changes to preconstruction survey organization, policies and procedures as specified in the Director's April 1999 memorandum. • In addition, have planned preconstruction survey location crews report to district Engineering Services Supervisor.
V-4 Evaluate process, technology, and procedures used for survey. Issues to address include: • Data collector system integration with design software. • Training and equipment in the District to perform preconstruction survey.

I. Introduction

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The Montana Department of Transportation (MDT) commissioned this *Performance Audit of Preconstruction Project Delivery* with oversight from the Montana Legislative Audit Division. The purpose of the audit is to evaluate MDT's preconstruction project delivery processes in order to identify where the Department has opportunities for reducing the time and cost of delivery of preconstruction projects while maintaining quality.

A. Background

The MDT's business involves the operation, preservation, and improvement of the state's transportation system. Its core business activities include the design and construction of highway projects in the Statewide Transportation Improvement Program (STIP). This performance audit addresses Montana's preconstruction project delivery process, a core business process through which the MDT designs the projects which are then delivered through the construction program.

The preconstruction process includes all the work activities required to develop a project specified in the STIP into the detailed plan specifications and estimates that are used by contractors as their construction plan. This is a very complex process that is performed by several management units in headquarters and the districts. The MDT model for the design process indicates that for certain types of projects it can involve over 100 activities performed in three distinct phases. For large projects, the process from start to finish can take over ten years. The process involves many different engineering disciplines and functional areas of expertise that include: project management, highway design, structural engineering, hydraulics, environmental engineering, traffic engineering, right-of-way, utilities, environmental analysis and others.

The purpose of the performance audit is to evaluate MDT's preconstruction design process and develop recommendations to improve the efficiency, effectiveness, and quality of the process. The intent is to develop implementable recommendations for which the audit has identified a business case. These are recommendations where we anticipate that the potential benefits to MDT will exceed the costs for implementation and justify the risks associated with making organizational and procedural changes.

B. Approach

This audit was conducted according to United States General Accounting Office (GAO) guidelines. The approach is described below.

1. Audit Areas

Four distinct areas were analyzed in the audit, as determined by initial issue identification interviews, senior management, and a technical advisory committee. The four study areas for the audit are:

- **Program Delivery**. How well is MDT managing the overall preconstruction process to deliver the transportation program?
- **Project Management and Delivery**. What is MDT's project management performance for preconstruction projects?
- **Environmental Process**. How well is MDT managing the environmental activities as related to the delivery of transportation improvement projects?
- **Preconstruction Survey**. What is MDT's performance in preconstruction survey delivery?

2. Quality Assurance

In order to maintain the highest standards of quality and independent review the following steps were taken:

- The audit was performed according to the GAO guidelines as presented in the Government Auditing Standards: 1994 Revision.
- The performance audit received independent oversight and quality assurance review from the Montana Legislative Audit Division.

3. Audit Questions

To complete this audit and determine what areas should be examined in detail, as well as determine where MDT could make improvements to its processes and organization, several questions were posed and then answered through data collection and analysis. The results of the analysis provided answers to the questions and also indicated areas for improvement.

The audit questions for each of the audit areas are as follows:

a. Overall program delivery

- What are the overall trends in program delivery?
- How well positioned is MDT to deliver the program funded by TEA-21?
- Is MDT delivering what it says it will deliver?
- Does MDT have the management controls, procedures, and capacity to manage the increase in consultant-designed projects?

b. Project level analysis

- Are preconstruction projects delivered on budget?
- Are projects delivered on schedule? How long is it taking to design projects?
- Are projects delivered within scope?
- Is the letting schedule stable?
- What is the quality of the work performed and is quality built into the process?
- What causes schedule delays? Which activities cause delay and add cost to the design process?
- Does MDT have efficient and effective management controls, accountability structures, and organization for project delivery?
- Does MDT have the necessary tools and procedures for managing preconstruction project delivery?

c. Environmental process

- Are MDT environmental functions causing delays to the preconstruction process and the letting schedule?
- Is adequate time currently planned to complete environmental tasks?
- Are environmental functions for preconstruction projects adequate to satisfy all necessary regulatory requirements? Is more being done than necessary to meet minimum regulatory requirements? If so, what is being done, and why?
- What are the requirements for external agency input for preconstruction projects and are they creating a time variable outside of MDT control?
- What are the requirements for timely public involvement input into preconstruction projects, and are they being met?

d. Preconstruction survey

- Are preconstruction surveys delivered on budget?
- Are preconstruction surveys delivered on schedule?
- Does preconstruction survey have effective management, organization, and resources?

4. Audit Methodology

To meet the objectives of the review, our approach included a set of tools and methodologies designed to reach beyond perceptions and carry out quantitative and qualitative analyses that are based on fact. The following summarizes our audit approach:

- **Work with a technical advisory committee.** A technical advisory committee comprised of MDT preconstruction management and engineering staff provided input on data sources and perspective on findings. The committee assisted in collecting data; identifying performance indicators, resources, and interview partners; and providing the linkage to ongoing improvement efforts by different parts of MDT.
- **Clarification and definition of the questions to be answered by the review.** To ensure that the audit stayed focused and addressed the most important questions regarding preconstruction, the audit team received input from MDT management and the technical committee to precisely define the questions that would be researched and answered during the audit. This helped manage the scope of the effort and ensured that expectations about the products and results of the audit were defined and agreed upon at the outset.
- **Visits to all MDT districts and conducting interviews.** Interviews of preconstruction project delivery staff at headquarters and in all five districts (including designers, design supervisors, Area Engineers, Engineering Services Supervisors, District Administrators, right-of-way and survey supervisors, and environmental engineering staff) to evaluate management controls, accountability structures, organization, and procedures for project delivery.

  All interviews were conducted with a structured interview guide that ensured consistency of the information gathered. The interviews were used to identify data and information sources, identify and determine issues that should be addressed by the review, and provide a control mechanism to ensure that data and information used in the analysis were reliable and relevant.

- **Review of existing documentation on procedures, rules, standards, and regulations.** The team collected and reviewed all documented policies, procedures and other guidance material available to MDT managers, staff, and contractors.

- **Collecting and analyzing data.** MDT maintains a variety of data related preconstruction projects in a number of different systems and documents. For this review, data from the following sources were used:
  - Statewide Transportation Improvement Program (STIP), the Montana Redbook, and other planning documents produced in the past three to five fiscal years.
  - Project Management System (PMS) and Detailed Ledger cost accounting data for Federal Aid projects let in fiscal years 1997/98 and 1998/99.
  - Statewide Budgeting and Accounting System (SBAS) and Cost Accounting Record Entry System (CARES) accounting system records for the past five years.
  - Phase Review and Letting Review meeting minutes.
  - Human resource data.
  - Construction Division change order information.
- **Measuring MDT's performance against a set of performance measures and benchmarks.** To determine the performance of MDT's preconstruction project delivery process, we used a series of performance measures designed both to confirm good practice within MDT and identify opportunities for improvement. This included MDT-specific performance measures and measures based on research and current practice elsewhere.

C. Report Structure

The main body of this report is organized into the following sections:

II. Overall Program Delivery. This section presents findings and recommendations from the review of MDT's ability to manage preconstruction delivery of the transportation program.

III. Project Level Analysis. This section assesses MDT's performance in management and delivery of preconstruction projects and makes recommendations for improvement.

IV. Environmental Process. This section presents the findings and recommendations from the review of MDT's management of the environmental process as it relates to delivery of transportation improvement projects.

V. Preconstruction Survey. This section evaluates MDT's performance in preconstruction survey delivery and makes recommendations for improvement.

Each of these sections presents the findings and conclusions identified through the audit analysis and provides recommendations that address them.

II. Program Delivery

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A. Introduction

This section presents the aggregate analysis of MDT's performance in preconstruction program delivery over the last four years.

1. Background

Program delivery is defined as the delivery of preconstruction projects from project nomination to advertising plans for construction.

Analysis included examining the projects let for construction over the last five years, comparing those let to the projects planned for letting, examining MDT's plans for future projects, and evaluating the management controls MDT has for delivering the projects.

2. Audit Questions

The audit questions answered in this section are:

- What are the overall trends in program delivery?
- How well positioned is MDT to deliver the program funded by TEA-21?
- Is MDT delivering what it says it will deliver?
- Does MDT have the management controls, procedures, and capacity to manage the increase in consultant-designed projects?

Each of these is addressed in turn.

3. Approach

The approach taken was to evaluate at the aggregate level MDT's overall performance in transportation program delivery. The major focus was to assemble and analyze data on projects delivered (or let) for construction as well as plans for delivering projects for the last five years, and plans for future project deliveries. Using these data sources, measurements and indicators of MDT's performance were calculated.

The specific approach taken to assess the performance of MDT's overall program delivery function involved the following activities:

- Aggregate and detailed analysis of project delivery data on projects planned and delivered between 1995 and 1999. The data sources used included the database of let projects, MDT State Transportation Improvement Plan (STIP) documents, and MDT Redbook plans.
- Development of forecasted project deliveries, based on previous delivery performance, backlog of undelivered planned projects, and projects planned for future delivery.
- Review of policies and procedures for managing and delivering internally and externally designed projects.

The measurements used for determining MDT's program delivery performance include the size of the transportation program, in terms of number of projects and total value of construction contracts let, and how much the program has changed over time. An additional measurement is the comparison of MDT's plan versus actual projects delivered. Other measures for project delivery are how well program management processes work.

B. Findings and Conclusions

1. What Are the Overall Trends in Program Delivery?

a. Since 1996, MDT's construction program has steadily increased. It has risen by $60 million.

- **Measurement.**

  To measure program delivery trends, projects let for construction for fiscal years 1996 through 1999 were evaluated. The total number of projects, the total value of construction contracts let per year, and the type of projects let were used as performance indicators.

- **Evidence.**

  Exhibit II-1 outlines the overall trends in program delivery for state and federally funded projects let between 1996 and 1999. When reviewing the exhibit it is important to note that the data measures the number and dollar value of projects advertised by fiscal year. This is not the same as the dollar value obligated because funds can be obligated in the current fiscal year for projects that are advertised and let in the following fiscal year, provided completed plans, specifications, and estimates are approved by the Federal Highway Administration in the current fiscal year.

Exhibit II-1: Number and Dollar Value of Construction Projects Advertised, FY1996 – FY1999

	Fiscal Years									
	1996		1997		1998		1999		Change 1996 - 1999	
		Percent		Percent		Percent		Percent		Percent
Number of Projects:										
- State funded	32	25%	33	21%	29	17%	28	18%	(4)	(8)%
- Federally funded	94	75%	123	79%	139	83%	130	82%	36	8%
Total	**126**		**156**		**168**		**158**			
Total Contract Value (millions):										
- State funded	$36.5	21%	$23.8	13%	$15.9	8%	$20.8	9%	(15.7)	(43)%
- Federally funded	$134.0	79%	$155.8	87%	$177.0	92%	$210.3	91%	75.4	58%
Total	**$170.5**		**$179.5**		**$192.8**		**$231.0**		**59.6**	**36%**
Average Values (millions)										
- Overall	$1.6		$1.4		$1.5		$1.9			
- State funded	$1.1		$.7		$.5		$.7			
- Federally funded	$1.9		$1.7		$1.7		$2.3			

Source: MDT, Dye Management Group, Inc. analysis.

The data presented in Exhibit II-1 indicate that:

- **Since 1996, the value of projects let for construction has increased.** The value of projects let has steadily increased. Since 1996, the value of federal projects let has increased by over 15 percent per year. At the same time, the value of state projects let has decreased. In terms of dollar value of projects let, MDT's program has increased by more than 35 percent.

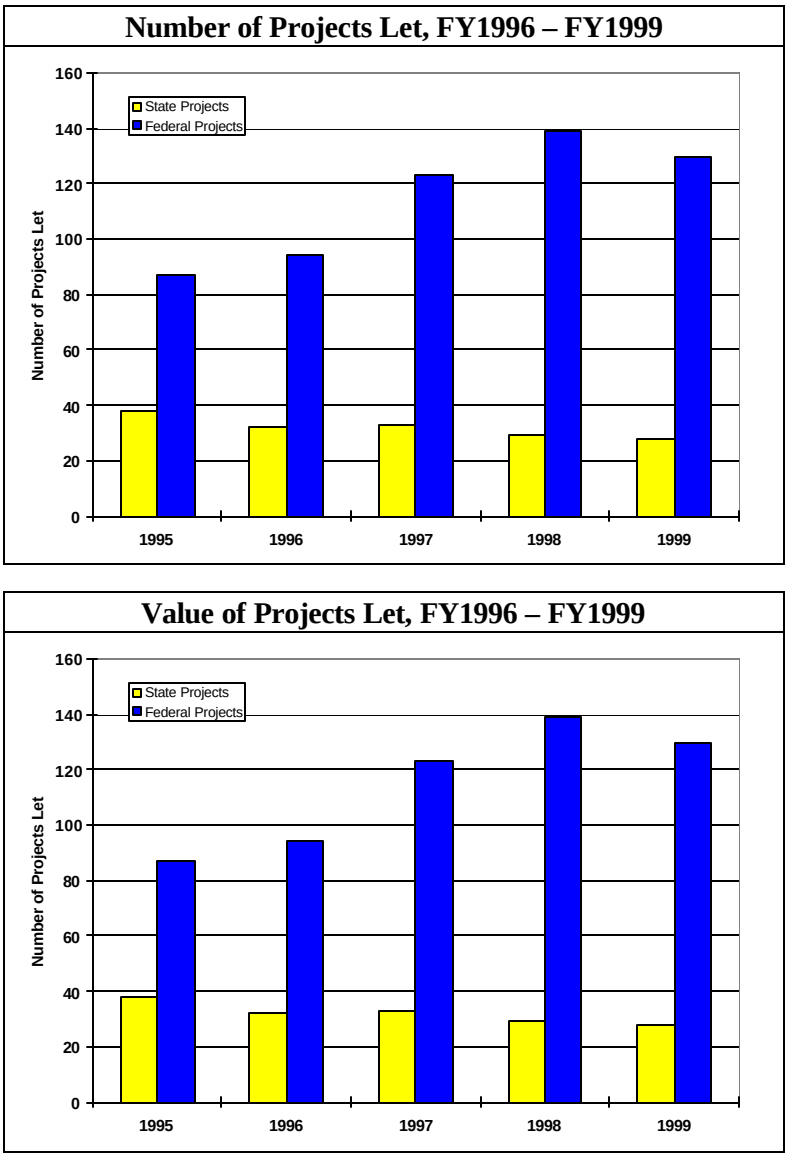
- **State funds are increasingly used to provide the match for federal funding.** Between 1996 and 1999, federal funds have taken on a more dominant role in supporting transportation projects in Montana. To provide the state funding match to the increased federal program, MDT has shifted funds toward federally funded projects. By 1999, 91 percent of the construction contract dollars were on federally funded projects.

- **The number of state funded projects has remained fairly consistent but their value has fallen.** The sum of all projects let over the four year period shows that while state projects consistently make up about a quarter of all projects, the value of these projects is less than 15 percent of the total value of all state and federally funded projects. Because there has been considerable growth in the size of federally funded projects, the portion of the total contract value going

to state projects has decreased. Federal funding of projects has increased at over 16 percent per year, since 1996. Over the same period, the number of solely state funded projects has decreased by 40 percent.

Exhibit II-2 graphically illustrates the variation in the number of projects and total value of construction contracts let.

Exhibit II-2: Variation in Number of Projects and Total Value of Construction Contracts Let



Source: MDT, Dye Management Group, Inc. analysis.

– **Since 1996, the value of contracts let for new construction/ reconstruction, resurfacing/minor widening, and bridge projects has doubled.** MDT project delivery trends were analyzed by type of project. Using information in the PMS system, MDT's standard work-type codes, and STIP documents, projects were assigned into eight categories. From this, we analyzed the projects let from fiscal year 1996 through 1999. Exhibit II-3 presents the results of the categorizations of the projects let.

Exhibit II-3: Number and Total Value ($million) of Construction Contracts Let for Projects, FY1996 – 1999

Project Categories	Fiscal Years									
	1996		1997		1998		1999		Change in Value 1996 - 1999	
	Let	Value	Let	Value	Let	Value	Let	Value	Value	Percent
New & Reconstruction	15	$56.4	12	$72.2	15	$71.0	24	$110.3	$54.0	96
Resurface/Minor Widen	28	$66.7	19	$31.2	28	$46.0	30	$61.0	$(5.6)	(8)
Restore/Rehabilitation	2	$0.2	0	$0.0	7	$15.6	5	$12.1	$11.9	100
Bridge Work	5	$7.3	17	$12.7	17	$17.6	18	$21.1	$13.7	187
Safety/Traffic	25	$15.8	19	$10.3	22	$5.7	20	$13.0	$(0.3)	(2)
Environmental	5	$0.8	2	$0.3	0	$0.0	1	$0.9	$0.1	11
Miscellaneous/Other*	11	$4.1	29	$16.0	22	$9.4	15	$6.5	$0.8	13
Subtotal	**91**	**$151.3**	**98**	**$142.7**	**111**	**$165.5**	**113**	**$225.0**	**$74.5**	**48**
Other Projects **	***9***	***$15.9***	***20***	***$33.2***	***19***	***$24.5***	***3***	***$1.9***	***$(14.0)***	***(88)***
CTEP Projects	***26***	***$3.3***	***38***	***$3.7***	***38***	***$2.9***	***42***	***4.2***		
Grand Total	**126**	**$170.5**	**156**	**$179.5**	**168**	**$192.8**	**158**	**$231.0**	**$60.5**	**36**

Source: Derived from MDT database of Let projects and STIP documents.
Note (*): Includes emergency repair projects.
Note (**): Other projects not listed in the STIPs or Redbooks that were let.

The exhibit includes projects that were categorized as state and federally funded, and those projects identified as "other projects". Other projects are those listed as let, but that could not be linked back to planning documents during the audit analysis.

– **The data in Exhibit II-3 indicate that new construction/ reconstruction and bridge projects account for most of the program growth.** Interviews conducted with preconstruction employees revealed a perception that "MDT has been doing the easy projects." This is not supported by the facts. Overall, new construction/reconstruction and bridge projects have more than

doubled in contract value since 1996. In 1999 alone, federal funding of new construction/reconstruction projects increased by 30 percent. These project types typically require more internal and external resources for completing preliminary engineering than simpler, less complex resurfacing projects.

b. MDT has made gains in productivity to deliver an increased program.

- **Measurement.**

  MDT's annual expenditures on preconstruction labor were estimated. Productivity was measured as the lagged ratio of preconstruction activity labor costs to the dollar value of design delivered. This is an imperfect measure because any one year cost also includes labor expended on projects that will not be ready for a number of years. However, at the program or MDT-wide level, this measure does provide a reasonable indicator of trends in productivity.

- **Evidence.**

  Exhibit II-4 provides the total preconstruction activity labor costs from 1995 to 1999.

Exhibit II-4: Preconstruction Activity Labor Expenditures, FY1995 – FY1999

($ Million)

Labor[1] Expenditures	Fiscal Year[2]				
	1995	1996	1997	1998	1999
Design	$3.7	$3.9	$3.9	$4.1	$4.4
Environmental	$.6	$.6	$.6	$.6	$.7
Engineering Management[3]	$.3	$.4	$.3	$.3	$.3
Right-of-Way	$1.3	$1.4	$1.5	$1.7	$1.8
Survey	$1.4	$1.2	$1.3	$1.3	$1.7
Total MDT Labor	**$7.2**	**$7.4**	**$7.7**	**$8.0**	**$9.0**
Total Consultant Expenditures[4]	**$5.5**	**$9.6**	**$5.8**	**$5.6**	**$20.6**
Grand Total	**$12.6**	**$16.9**	**$13.4**	**$14.0**	**$29.5**

Source: MDT SBAS, Dye Management Group, Inc. analysis.
[1] Consists of regular and overtime labor charges.
[2] Totals may not add due to rounding. Expenditures are in thousands of then year dollars.
[3] Includes both engineering management and project management.
[4] Includes all consultant costs reported in SBAS. Includes design, survey, and environmental.

Overall, the exhibit shows the following:

- MDT preliminary engineering labor expenditures remained fairly constant from 1996 to 1998. They increased by a large amount from 1998 to 1999. This reflects the extra labor required to design projects that will be delivered in the next three fiscal years.
- Consultant expenditures remained fairly constant per year until 1999, at which point consultants took on significantly more work from MDT, and expenditures increased to over $20 million. This is an indicator that outsourcing and contracting out of some functions is being conducted to ensure that the expanded program is delivered.

As an indicator of productivity, the ratio between current year labor costs associated with preliminary engineering functions and following year projects let was completed. This is presented in Exhibit II-5.

Exhibit II-5: Preliminary Engineering Productivity

	Fiscal Year				
	1995	**1996**	**1997**	**1998**	**1999**
Value of Projects Let	$201.9	$170.5	$179.5	$192.8	$231.0
PE Costs	$12.6	$16.9	$13.4	$14.0	$29.5
PE Costs/Following Year Projects Let	7.4%	9.4%	6.9%	6.1%	n/a

Source: MDT, Dye Management Group, Inc. analysis.

The exhibit indicates a fairly consistent increase in productivity.

2. How Well Positioned Is MDT to Deliver the Program Funded by TEA-21?

a. MDT is well positioned to obligate Montana's available federal funds based on:

- **MDT's FY99 performance.**
- **The dollar volume of design work in PMS.**
- **The increased use of design consultants.**
- **Senior management focus on project delivery.**
- **Measurement.**

The enactment of the federal Transportation Equity Act for the Twenty-first Century (TEA-21) greatly increased the federal surface transportation funds

available to Montana. The work that MDT must perform to ensure that these funds are obligated (committed) for projects in Montana, has also increased by a corresponding amount. After the first year of TEA-21, there was considerable concern from Montana policy-makers and transportation interests that there was a risk that MDT would not obligate all the available federal funds.

The key indicator is federal funds obligated by year. The value is obtained as the low bid estimates on contract/construction plans. An important goal for MDT is to use all of its fiscal year federal aid limitation authority.

- **Evidence.**

  Exhibit II-6 presents MDT's obligation levels for fiscal years 1997 through 1999.

Exhibit II-6: Federal Funds Obligated, FY1997 – FY1999

	Fiscal Year			97 - 99 Percent Change
	1997	1998	1999	
Federal Authorization	$157.9	$200.3	$260.6	65%
Obligated Funds	$155.9	$170.7	$257.2	65%
Value of Contracts Let	$175.9	$189.9	$226.8	29%
Gap Between Authorization and Obligation	**$2.0**	**$29.6**	**$3.4**	

Source: MDT Summary data

In the three years from 1997 to 1999 the dollar value of construction work obligated per year has increased by 65%. As shown in Exhibit II-6, by FY1999 MDT was obligating federal funds at close to the authorization limit. Concern about MDT's ability to obligate funds arose because the rate of obligation did not increase rapidly initially and there was a large shortfall in 1998.

Looking ahead for the balance of TEA-21, MDT is well positioned to obligate the available federal funds. Experience in FY1999 has demonstrated that MDT is able to deliver $260 million of preconstruction projects per year.

The risk of not obligating available federal funds is further mitigated by the large volume of work, for the balance of TEA-21, that will be delivered by design consultants. Very little of the design work completed in FY1999, or previously, was completed in its entirety by design consultants. The large

volume of design consultant projects in the pipeline will enable MDT to catch up and obligate federal aid authorizations that have been carried over from prior years.

MDT now has 118 projects that involve an estimated $100 million of construction that are being developed by design consultants. This has increased the value of design in the project delivery pipeline and reduced MDT's risk of not obligating available federal funds.

Exhibit II-7 indicates the federal aid authorization for the balance of TEA-21.

Exhibit II-7: Forecast of Transportation Improvement Program for MDT, FY2000 – FY2003

Fiscal Year	Obligated	Federal Aid Authorization	Carry Over From Prior Years
1997	155.9	$157.9	
1998	170.7	$200.3	
1999	257.2	$260.6	$33.0
2000		$251.0	
2001		$247.0	
2002		$249.0	
2003		$252.0	
2004+			

Source: MDT Planning Division

3. Is MDT Delivering What It Says It Will Deliver?

a. Based on dollar value, MDT delivered just over 50% of the planned program for 1998 and 1999.

- **Measurement.**

  At the program level, an important objective for MDT is to deliver the projects that are planned. MDT has two documents that list specific highway improvement projects by fiscal year that MDT plans to let to contract.

  The Statewide Transportation Improvement Program (STIP). Published every year, this document contains a list, by year, by district, of state and federal projects that will be let over the following three fiscal years. In

addition, the STIP presents each project's estimated costs, for each work phase, for preliminary engineering, right-of-way, and construction.

The Montana Redbook. This document contains MDT's tentative long range construction plan. It lists all federally supported projects that are planned to be let over the course of the next five fiscal years, their estimated costs, and the projected let dates. The frequency of Redbook publication has varied. However, the intent is to have the Redbook published at the beginning of the fiscal year, to provide the plan for that fiscal year. The first three years of the Redbook should be the same as the first three years in the STIP.

In addition, the PMS system can identify, based on the schedule, all the projects that will be ready in each fiscal year. Controls are in place that aim to ensure that no project can be programmed for delivery in the STIP or Redbook unless it has a PMS ready date that makes the commitment feasible.

The STIP and the Redbook delivery plans were used to measure performance. The specific measures used in this audit to evaluate overall program delivery performance were:

- The number of projects let, that were programmed in the STIP for a given fiscal year, at the beginning of that fiscal year, compared to the total number of projects programmed in the STIP for that fiscal year at the beginning of the fiscal year.
- The dollar value of construction projects let, that were programmed in the STIP for a given fiscal year, at the beginning of that fiscal year, compared to the dollar value of projects programmed in the STIP for that fiscal year at the beginning of the fiscal year.
- The number of projects let that were planned in the Redbook for a given fiscal year at the beginning of that fiscal year compared to the actual number let.
- The dollar value of projects that were planned in the Redbook for a given fiscal year at the beginning of that fiscal year compared to the actual number let.

Conducting this measurement is not straightforward. Analysis across multiple years is difficult. The STIP and the Redbook are revised annually and it can be difficult to track projects in these plans from one year to the next. This is because projects can be renumbered, combined, or change from state to federally funded. In addition, the STIP is subject to amendment after approval. This results in projects listed in one source (e.g.

hardcopy of the 1999 STIP) that were not listed in the corresponding electronic version of the same STIP.

- **Evidence.**

Exhibit II-8: Comparison of Total Number of Projects Planned Versus Actual Project Delivery, FY1997 – FY1999

	Fiscal Year		
	1997	**1998**	**1999**
Number of Projects			
- Planned in STIP	174	147	201
- Let*	156	168	158
Gap	**(18)**	**21**	**(43)**
Value Construction Contracts Let			
- Planned in STIP	$216.8	$198.3	$330.4
- Let*	$179.5	$192.8	$231.0
Gap	**($37.2)**	**($5.5)**	**($99.4)**

Source: MDT Final documented STIPs FY1997 through FY1999, Dye Management Group, Inc. analysis.
Note (*): Includes projects not in the original delivery plan for that year at the program level that were let. Also includes Community Transportation Enhancement projects.

As shown in Exhibit II-8, the STIP indicated that:

- MDT planned to deliver over $330 million in projects in 1999, nearly 66 percent more than in 1998, and 53 percent more than in 1997. MDT also planned to complete the preliminary engineering on 201 projects in 1999, 35 percent more than in 1998.
- In 1999, 79 percent of the total number of projects planned (158 of 201) were delivered. In addition, 70 percent of the planned contract values were actually let.
- In 1998, over 97 percent of the planned funds were obligated.

Exhibit II-9 provides a breakdown for 1997 to 1999 of the dollar value of construction projects programmed in the STIP for each fiscal year, at the beginning of that fiscal year, compared to the value of the construction projects let.

Exhibit II-9: Comparison of Dollar Value of Construction Projects Planned in the STIP to the Value Let, by Project Type, FY1997 – FY1999

($million)

Project Types	1997		1998		1999	
	Planned	**Let**	**Planned**	**Let**	**Planned**	**Let**
New & Reconstruction	$113.6	$72.2	$101.5	$71.0	$166.4	$110.3
Resurface/Minor Widen	$57.8	$31.2	$53.2	$46.0	$83.5	$61.0
Restore/Rehabilitation	$10.4	$0.0	$3.0	$15.6	$11.3	$12.1
Bridge Work	$10.6	$12.7	$22.9	$17.6	$39.9	$21.1
Safety/Traffic	$16.8	$10.3	$13.4	$5.7	$24.5	$13.0
Environmental	$0.2	$0.3	$1.1	$0.0	$1.0	$0.9
Miscellaneous/Other	$2.3	$16.0	$0.0	$9.4	$1.7	$6.5
Subtotal	**$211.6**	**$142.7**	**$195.2**	**$165.5**	**$328.3**	**$225.0**
Other Projects Delivered [1]		***$33.2***		***$24.5***		***$1.9***
CTEP Projects	***$5.2***	***$3.7***	***$3.1***	***$2.9***	***$2.1***	***$4.2***
Grand Total	**$216.8**	**$179.5**	**$198.3**	**$192.8**	**$330.4**	**$231.0**
Percent of Target Value Delivered		**82.8%**		**97.2%**		**69.9%**

Source: MDT STIP and Let data, Dye Management Group, Inc. analysis
[1] Projects not in original STIP, or which could not be categorized.

The analysis included auditing the electronic and published STIP data to ensure they were consistent with one another. Analysis of the FY1996 data was not completed due to changes in format of planning documentation. For all but four categories of projects, MDT did not meet its planned level of project delivery.

Exhibit II-10 presents similar data but compares the number of projects programmed in the STIP to the actual number of projects let to construction by project type.

Exhibit II-10: Comparison of Number of Projects Planned in the STIP to the Number Let, by Type, FY1997 – FY1999

Project Types	1997		1998		1999	
	Planned	**Let**	**Planned**	**Let**	**Planned**	**Let**
New & Reconstruction	25	12	24	15	33	24
Resurface/Minor Widen	39	19	36	28	64	30
Restore/Rehabilitation	1	0	9	7	15	5
Bridge Work	21	17	25	17	32	18
Safety/Traffic	28	19	22	22	28	20
Environmental	1	2	2	0	1	1
Miscellaneous/Other	3	29	0	22	4	15
Subtotal	***118***	***98***	***118***	***111***	***177***	***113***
Other Projects Delivered [1]		***20***		***19***		***3***
CTEP Projects	***56***	***38***	***29***	***38***	***24***	***42***
Grand Total	**174**	**156**	**147**	**168**	**201**	**158**
Percent of Planned Number of Projects Delivered		**90%**		**114%**		**79%**

Source: MDT, Dye Management Group, Inc. Analysis
[1] Projects not in original STIP, or which could not be categorized.

The exhibit shows that MDT planned to let significantly more projects in 1999 than at any time in the past, and that the agency was delivering between 58 and 88 percent of the projects planned. In 1998, MDT planned to let 147 projects totaling $198.3 million in value. However, MDT developed a plan in 1999 calling for 201 projects totaling $330.4 million. On a percentage scale, MDT planned to fund 66 percent more projects in 1999 than in 1998. Reprogramming of funds and projects from one year to another may explain this occurrence.

b. In 1997, MDT delivered 70 percent of the STIP, but this fell to 53 percent (measured in construction value) by 1999.

- **Measurement.**

  The MDT STIP and let projects data were further compared to determine in which fiscal years individual projects were let, in comparison to the year in which they were originally planned for letting. STIP project data was examined closely and compared to the projects let from 1996 through 1999. Exhibit II-11 presents the results of the analysis.

- **Evidence.**

Exhibit II-11: STIP Delivery Performance FY1997 - 1999[1]

Fiscal Year	STIP Planned		Delivered		Percent Delivered	
	Number	$Million	Number	$Million	Projects	Value
1997 STIP	174	$216.8	71	$151.9	41%	70%
1998 STIP	147	$198.3	62	$99.3	42%	50%
1999 STIP	201	$330.4	79	$175.2	39%	53%

[1] Does not include other projects delivered in that year.

Between 1997 and 1999, the percent of the planned STIP actually delivered had decreased. By 1999 only 39 percent of the planned projects and 53 percent of the planned value were delivered. The data presented in Exhibit II-11 can be interpreted as follows:

According to the FY1997 STIP, of 290 projects listed and planned for construction, 174 projects were to be delivered in 1997. However, according to actual figures, only 71 of those 174 projects were delivered in 1997. However, these 71 projects delivered $151.9 million of planned construction or 70 percent of the STIP.

The STIP delivery was further analyzed to determine which year the projects were delivered. Exhibit II-12 provides an indication of both slippage and acceleration.

Exhibit II-12:Year In Which STIP Projects Let

STIP	Planned	Delivered			Total	Percent Delivered
		1997	1998	1999		
1997						
Projects	174	71	21	10	102	59%
Value	$216.8	$158.8	$29.0	$6.8	$193.9	89%
1998						
Projects	147	-	62	12	74	50%
Value	$198.3	-	$118.1	$20.3	$138.5	70%
1999						
Projects	201	-	10	79	89	44%
Value	$330.4	-	$17.0	$182.7	$199.7	60%

* 1999 STIP had eight projects listed that were let in late 1998 as part of FY98 authorization.

Exhibit II-12 can be interpreted as follows:

For the 1997 STIP, of the 174 projects planned to be delivered in 1997, 71 were delivered in 1997, 21 in 1998, and 10 in 1999. For the 1999 STIP, 79 were delivered in 1999, and 10 were in fact delivered in 1998. Some projects were advanced; for example, in 1999, five of the projects, worth $7.6 million in construction, were advanced for FY2000 to FY1999.

Combined, these two findings indicate that while MDT is delivering projects, the agency is not reaching its planned target of delivering projects on schedule. Project delays, reprioritizations, not prioritizing projects or other factors are causing some projects not to meet the schedule.

A second indicator used was Redbook delivery performance. Exhibit II-13 presents a similar analysis of data from the Redbooks for 1998 and 1999.

Exhibit II-13: MDT Redbook of Planned versus Actual Let Projects, FY 1998 and 1999

Fiscal Year	Redbook Projects	Completed		
		As Planned	Undocumented	Total
1998	69	55	60	115
1999	122	58	44	102

Source: MDT Redbook, Project Let Database, Dye Management Group, Inc. analysis.

The exhibit shows the number of projects listed in the each of the Redbooks, as well as the number of projects completed. In FY1999, MDT only delivered 58 of 122 (47 percent) projects listed in the 1999 Redbook. The undocumented projects appear high because it was difficult to track let data between the Redbooks, the project let database, and the STIP documents. Some of these projects are not listed in the Redbook since they are state-funded projects, including some annual material purchasing contracts.

4. Does MDT Have Effective Procedures for Managing Consultant Design Projects?

a. The number of consultant-designed projects has increased significantly.

- **The Consultant Design Section workload has increased.**
- **MDT has strengthened the procedures, controls, and management of design consultants.**

- **Measurement.**

  The volume and value of work performed by design consultants and the procedures used for managing design consultants were measured. MDT's procedures were compared to best industry practices as described in National Cooperative Highway Research Program Synthesis 277, Report Consultants for DOT Preconstruction Engineering Work.

- **Evidence.**

  An analysis was conducted on labor expenditures associated with preliminary engineering, taken from Montana's State Budget and Accounting System (SBAS). Exhibit II-4 showed that consultant expenditures increased from $5.6 million in 1998 to $20.6 million in 1999. An audit of the Consultant Design Section, completed in 1996, presented a number of findings and recommendations that the following conditions exist:

  – Insufficient organization of contract negotiations and cost estimating data.

  – Improper use of past performance criteria and ineffective collection of past performance when evaluating consultants.

  – Lack of authorization control over contract supplements (i.e., change orders).

  – No use of formal program/project management tools for managing consultant design schedules, resources, requirements, deliverables, etc.

  The Consultant Design Section has addressed the audit recommendations and implemented policies and procedures for managing consultants and the projects. Consultant design engineers are now responsible for all the steps required in preconstruction project delivery and must stamp their work.

  MDT has established a new consultant design manual that specifies the procedures that design consultants should follow. Further, the consultant design section is using past performance as a criteria in selecting design consultants. In the consultant design section, project engineers are providing proactive tracking of status and are holding consultant project managers accountable for schedule performance.

  In March 2000, there were 118 projects under Consultant Design. This is estimated to be close to 30 percent of the projects in PMS. This has greatly increased the workload of the Consultant Design Section. An analysis of the workload and level of responsibility for each of the project engineers working in the CDS shows that these individuals are responsible for significantly more work than is typically seen in comparable organizations.

Our analysis indicates that each project engineer in Consultant Design services will be responsible for approximately 20 to 25 projects.

C. Recommendations

Recommendation II-1: Establish a set of strategic department-wide management objectives, performance measures, and regular reports for project delivery.

- **Report progress against objectives to customers and senior management.**
- **Tie achievement of these objectives to management and employees' performance plans.**
- **Use objectives to provide leadership, set cultural direction, and provide accountability to customers.**
- **Use regular reporting to provide focus and accountability across functions, districts, and other units.**

This recommendation will involve establishing a broader set of overall management-level performance objectives for project delivery and program management. The measures should address efficiency, effectiveness, project delivery status information, and other key management information.

Examples of senior management-level efficiency measures could include the percent of construction costs accounted for by preliminary engineering, the ratio of preconstruction employees to dollar value of construction work designed, and the average or median length of time to deliver projects, among others.

Examples of senior management-level effectiveness measures could include percent of Redbook projects planned to be delivered within the fiscal year that were delivered within the fiscal year. (There are a number of variations on this measure that could be used).

Key management information could include: year-to-date preliminary engineering expenditures versus budget expenditures, "rolled up" project status reporting, and planned versus actual lettings by quarter.

Implementation Steps:

1. Confirm overall management objectives for project delivery, including purpose and role of performance measurement and reporting.
2. Establish management requirements and priorities for performance measures.
3. Select and prototype performance measures with senior managers.
4. Assign responsibilities for collecting and reporting information.
5. Specify line management responsibility for performance measure accomplishment.

6. Specify steps for institutionalizing the use of these measures.

Recommendation II-2: Improve the project delivery planning and management level reporting systems.

- **Establish and update project delivery plan monthly for all projects.**
- **Track delivery, expenditures, and obligation of funds on a year-to-date basis.**
- **Update plan periodically, based on PMS schedule changes.**
- **Report year-to-date delivery by funding category and planned delivery.**

This recommendation involves expanding the role of the project delivery plan and further institutionalizing it as "the plan" for project delivery that MDT is working towards. This requires broadening procedures such as the Redbook and PMS management to include all capital projects and to track and report progress against the plan. Once the procedures for reporting the data are established the desired frequency of reporting can be determined.

The intent of the recommendation is to define and prepare "enterprise-wide" reports on year-to-date project delivery and planned delivery in coming quarters. The reports would also provide targets 3, 6, 9, and 12 months across the entire department. This would provide more of a dynamic planning tool and would result in having information, similar to that included in the Redbook, adjusted and updated as projects are completed, accelerated, decelerated, or other circumstances change.

This information will be useful at the program management and line management levels. For program management, it will enable closer tracking of obligation to date, planned obligation, as well as adjustments to the project delivery plan. For line managers, particularly those providing labor-intensive services to the project design process such as right-of-way, survey, and others, this will provide improved information for work planning and resource loading.

Implementation Steps:

1. Identify how to amend existing procedures to implement recommendation. (This will include establishing a tie between the ready date and letting schedule.)
2. Establish a "ready date plan" by quarter for all projects, including state funded and federally funded STIP line items.
3. Develop and prototype report format.
4. Start preparing reports.
5. Use implementation work as input into the requirements definition for the recommendations to replace the PMS. (Recommendation III-7)
6. Institutionalize the use of the reports.

III. Project Level Analysis

■

D. Introduction

This section evaluates MDT's performance in project management and delivery of preconstruction projects.

1. Background

Preconstruction project delivery is the process through which a project included in the Statewide Transportation Improvement Program (STIP) is developed into a set of construction plans, specifications, and estimates. Since this is a review of the preconstruction process, project delivery is defined as all activities required to take a project from nomination through to advertisement for construction contract letting.

2. Audit Questions

The audit questions answered in this section are:

- Are preconstruction projects delivered on budget?
- Are projects delivered on schedule? How long is it taking to design projects?
- Are projects delivered within scope?
- Is the letting schedule stable?
- What is the quality of the work performed and is quality built into the process?
- What causes schedule delays? Which activities cause delay and add cost to the design process?
- Does MDT have efficient and effective management controls, accountability structures, and organization for project delivery?
- Does MDT have the necessary tools and procedures for managing preconstruction project delivery?

3. Approach

Evaluating preconstruction project management and delivery involved several steps. First, the accepted best practice performance measures of budget, schedule, scope, quality, and management controls were established. Next, data was assembled to quantify budget, schedule, scope, and quality. This data came from a variety of sources including the Project Management System (PMS), the Detailed Ledger, Phase Review and Letting Review meeting minutes, and construction change order records. Procedures and policies were then documented as part of evaluating management controls. Finally, interviews were conducted at headquarters and in the districts to determine how things work in practice.

The audit questions were designed to evaluate project management and delivery performance against the best practice criteria. The approach taken was as follows:

- **Budget.** Detailed analysis of the Department's PMS data and Detailed Ledger data on projects advertised between 11/1/97 and 9/30/99 was undertaken to evaluate budgeted and actual preconstruction labor expenditures. This analysis period was used consistently throughout the project level analysis. This ensured that the audit focused on the most recently completed preconstruction projects.
- **Schedule.** PMS and Detailed Ledger data on projects advertised between 11/1/97 and 9/30/99 were also used to evaluate project design durations and gaps in labor activity. Documentation and analysis of Letting Review Meeting minutes and analysis of letting data from Contract Plans Unit were used to determine letting delays and letting schedule stability. Documentation and analysis of Phase Review Meeting ready date changes (as recorded in the meetings by the Engineering Management Unit), as well as interviews, were used to determine which activities are causing delay and adding cost to the design process.
- **Project Scope.** Engineers' construction cost estimates at various design milestones (project nomination, preliminary field review, scope of work, advertisement, and actual award amount) were used as measures of whether projects are delivered in scope. Projects advertised between 11/1/97 and 9/30/99 were again used for consistency.
- **Quality.** Analysis of change order records from the Construction Division and review of departmental policies and procedures related to quality control (such as those contained in the PMS and Road Design manuals) were performed to evaluate preconstruction project quality.
- **Management Controls.** Interviews of preconstruction project delivery staff at headquarters and in all five districts (including designers, design supervisors, Area Engineers, Engineering Services Supervisors, District Administrators, and right-of-way and survey supervisors) were performed to evaluate management controls, accountability structures, organization, and procedures for preconstruction project delivery.

E. Findings and Conclusions

1. Are MDT Preconstruction Projects Delivered on Budget?

a. Analysis of planned versus actual labor hours shows that design activities are on budget, environmental activities are under budget, and survey and right-of-way activities are significantly over budget.

- **Measurement.**

  Planned labor hours (hours budgeted in PMS) compared to actual labor hours were used to measure preconstruction project delivery budget performance. It is important to note that "budget" here refers to MDT labor and/or consultant hours for preconstruction and not budget or costs for construction.

- **Evidence.**

  Exhibit III-1 summarizes the findings with regard to project budget performance.

Exhibit III-1: Planned versus Actual Labor Hours and Costs*

Function	PMS Planned Hours	PMS Actual Hours	Planned Labor Costs (Est.)[1] ($millions)	Actual Labor Costs ($millions)	Budget Variance
Preconstruction Survey	139,221	273,779	$1.8	$3.4	96.6%
Design	457,216	455,943	5.9	5.9	-0.3
Right-of-Way	158,277	225,325	2.1	3.0	42.4
Environmental	75,185	36,649	1.1	0.6	-51.3
Total	**829,899**	**991,696**	**$10.9**	**$12.9**	**18.1%**

*Based on data available for 108 Federal Aid Projects let in 1997/98 and 1998/1999.
[1]Based on hourly rates derived from Detailed Ledger actual labor costs.
Source: PMS and Detailed Ledger.

MDT has been accurate in budgeting labor hours for design, but labor hours for survey and right-of-way activities are significantly underestimated. Labor hours for environmental activities are overestimated. The following summarizes these findings:

- **Design activities are performed in budget.** Actual budgeted design labor hours are remarkably close to actual (within 0.3 percent). This is the largest component of labor costs at $5.9 million.

- **Survey activities are highly over budget.** Planned labor hours for preconstruction survey are significantly underestimated. Actual labor costs were 96.6 percent greater than planned. Actual preconstruction survey labor costs totaled over $3.4 million.

- **Right-of-way activities are over budget.** Labor hours for right-of-way are also underestimated by 42.4 percent. Actual right-of-way labor costs totaled $3.0 million.

- **Environmental activities are under budget.** Environmental costs were significantly under budget (51.3 percent), however, it should be noted that most of these activities are new in PMS so there is not a long history from which to calculate planning values.

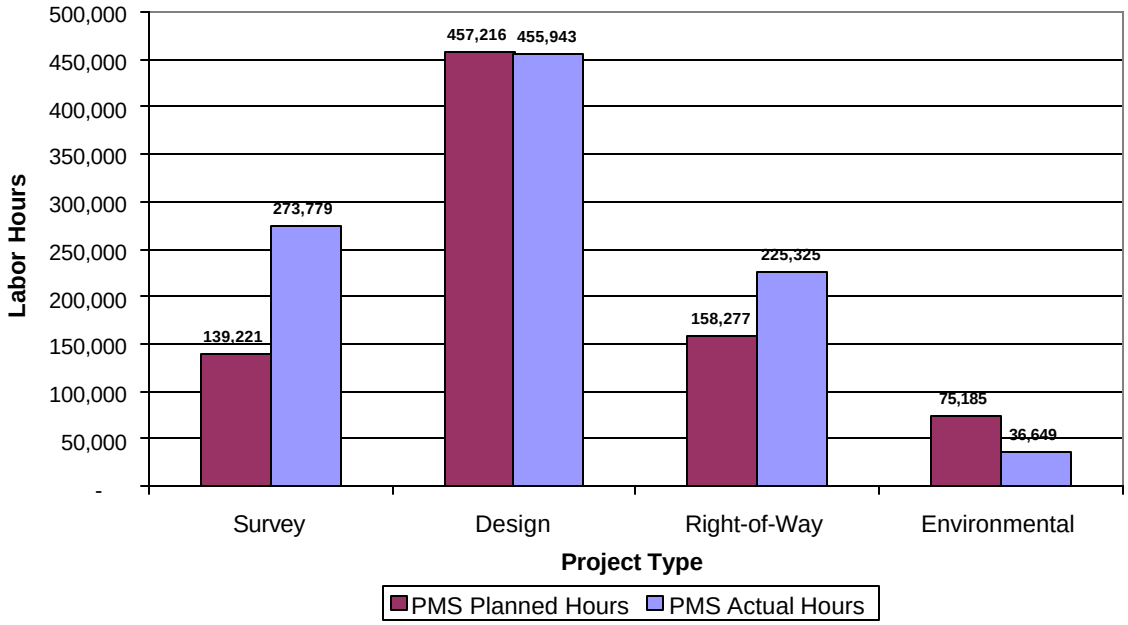
Exhibit III-2 summarizes the labor budget results by major function graphically.

- **Considerations.**

  The findings indicate large budget variance for survey, right-of-way, and environmental activities. It is important to note that the variances will in part be due to establishing inaccurate budgets (planned hours). These functional areas have placed less attention on establishing and using accurate unit values.

Exhibit III-2: Planned versus Actual Labor Hours and Costs

108 Federal Aid Projects Let in 1997/98 and 1998/99



Source: PMS and Detailed Ledger.

b. Management controls, reporting, and accountability structure for preconstruction budgets need strengthening.

- **Measurement.**

  Management reports and procedures for project-level tracking of preconstruction budgets were evaluated. Actual practices were identified through interviews and attending Phase Review and District Design Coordination meetings.

- **Evidence.**

  Interviews with preconstruction staff at headquarters and in all five districts, review of management reports, and accountability structure indicates the following:

  - **Line managers do not use budget to manage individual Preconstruction project delivery.** The project management culture is focused on schedule for design work, especially with the increased demands of TEA-21. Preconstruction budget information is limited and is not tracked.

  - **Senior management does not track and monitor preconstruction budgets as part of project delivery management.** The audit team found that management meetings related to preconstruction project delivery (Letting Review meetings, Phase Review meetings, and District Design Coordination meetings) are focused on schedule and budget is generally not a part of management tracking.

  - **There are limited financial management information systems for preconstruction project delivery.** Compiling the data to perform analysis of planned versus actual labor budgets proved to be a difficult exercise for the audit team as the data is not generally reported. State funded projects do not generally have a separate budget for preconstruction to which labor is charged. At the program level, it is a very difficult exercise to compile annual preconstruction expenditures.

- **Considerations.**

  There is limited accountability for the cost of preconstruction project delivery. Accountability is at the functional level and not the project level.

2. Are Projects Delivered on Schedule?

a. It is not possible to evaluate the original project duration versus the actual duration for preconstruction projects. However, analysis from STIP delivery, Phase Review, and Letting Review meetings indicates that a sizeable percentage of projects are not delivered on their original planned schedule.

- **Measurement.**

  An industry standard for evaluating project management is comparing the planned to the actual completion date. Our indicator for performance would be to compare the planned ready date when the project is first entered in PMS to the actual ready date.

- **Evidence.**

  The audit team found that it is not possible to evaluate planned versus actual completion for preconstruction projects with the current data.

  - **The project management system does not retain original schedule information.** Project activities and planned durations are initially programmed into PMS once a federal aid agreement is established. The problem is that as ready dates are changed no information is retained on the original ready dates. The original ready dates are overwritten. This is because the PMS only provides a "snap-shot" of the latest information entered into it.

  - **STIP delivery, Phase Review, and Letting Review meetings indicate some schedules are not met.** The analysis in the following sections provides perspective on this.

3. How Long Is It Taking to Design Projects?

a. Analysis of preconstruction project delivery time indicates significant opportunities for reducing delivery time. There is a wide range in the length of delivery time.

- **Measurement.**

  Because it is not possible to determine planned to actual schedule performance, the audit team measured the actual duration of preconstruction projects. The analysis of how long projects take to design was performed in two ways:

  1. PMS data were used to determine the length of time between the following preconstruction milestones: preliminary field review (PFR)

and scope of work; and scope of work (SOW) and "ready date". Ready date refers to the end of the PMS network when plans are ready to go to Contract Plans for final review, development of bid packages, and advertisement. Since management units must "card out" or close activities, the audit team determined that the end dates of activities at these milestones were reliable enough for the analysis.

2. Detailed Ledger data were used to identify the actual dates on which activities were performed. The overall project length is measured by the time between when labor charges by preconstruction management units first occur and last occur on a project. Additionally, the data were used to determine the longest gaps in activity on projects – providing an indication of projects that experience delays in activity for whatever reason.

- **Evidence.**

  Exhibit III-3 shows average duration between project milestones, based on PMS data. Exhibit III-4 shows the distribution of duration between project milestones for the projects analyzed.

Exhibit III-3: Average Duration between Project Milestones*

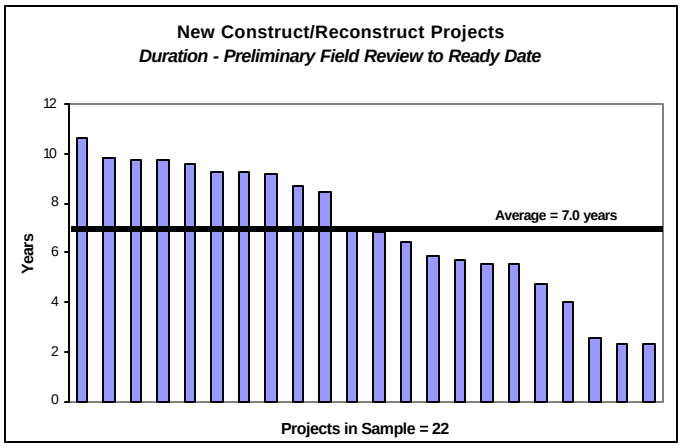
Type of Project	Milestones	Years
New Construct/Reconstruct	PFR to SOW	4.6
	SOW to Ready Date	2.4
	Total	*7.0*
Restoration/Rehabilitation	PFR to SOW	3.5
	SOW to Ready Date	0.7
	Total	*4.2*
Resurfacing/Minor Widening	PFR to SOW	2.2
	SOW to Ready Date	0.6
	Total	*2.8*
Bridge	PFR to SOW	2.5
	SOW to Ready Date	1.1
	Total	*3.6*
Safety/Traffic	PFR to SOW	1.9
	SOW to Ready Date	0.7
	Total	*2.6*
Average of all projects	PFR to SOW	2.9
	SOW to Ready Date	1.1
	Total	*4.0*

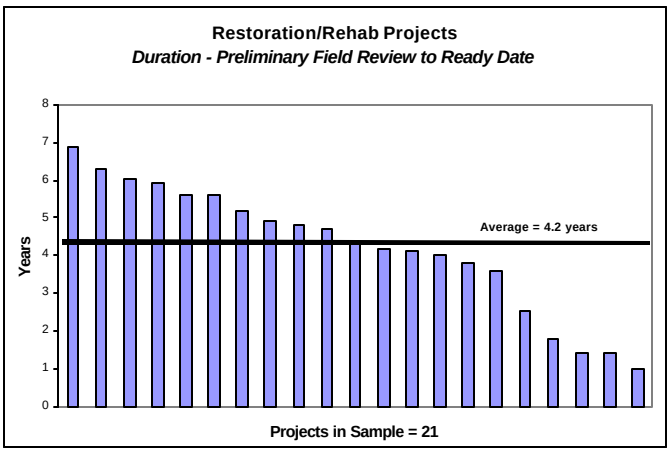
Notes: PFR = Preliminary Field Review SOW = Scope of Work
*108 Federal Aid Projects Let in 1997/98 and 1998/99
Source: MDT Project Management System (PMS) data.

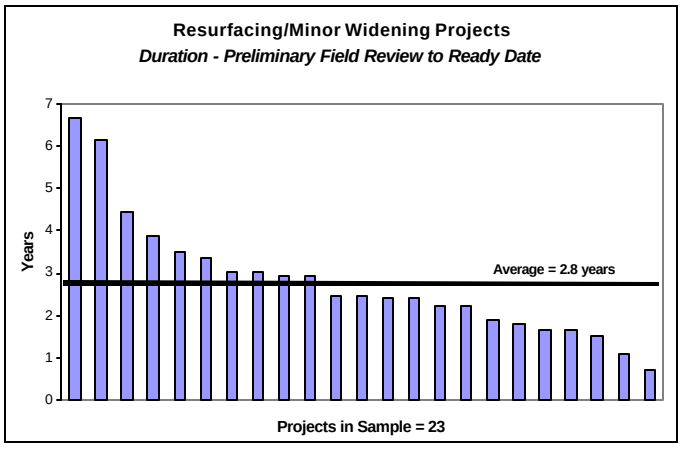
Exhibit III-3 illustrates the following with regard to average duration between project milestones:

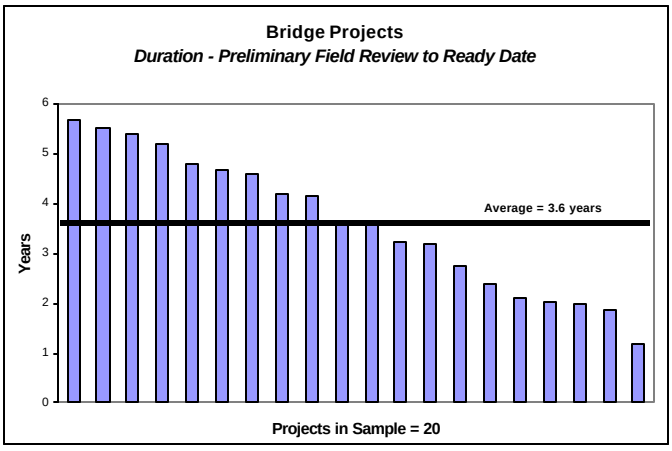
- On average, for all 108 projects, it took four years from PFR to Ready Date.
- New construct/reconstruct projects are taking, on average, seven years to deliver from preliminary field review to ready date.
- Both restoration/rehab and resurfacing/minor widening projects involve significant time to develop from preliminary field review to scope of work, but scope of work to ready date delivery is much shorter when compared to new construct/reconstruct. This may indicate a "reserve" of these projects that can be delivered quickly when need be.

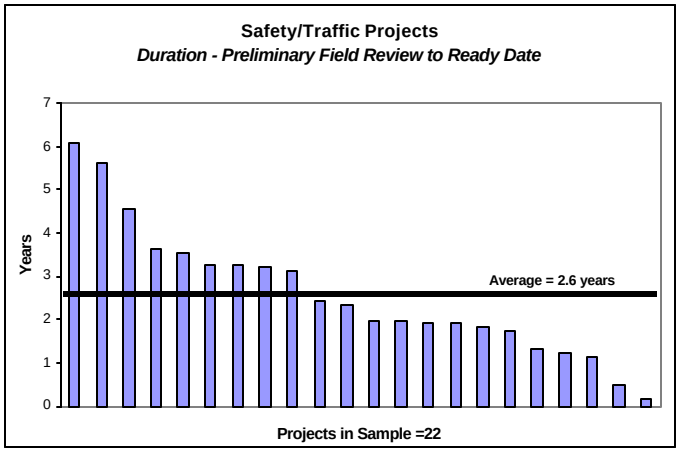
Exhibit III-4: Distribution of Project Durations











Source: Dye Management Group, Inc. derived from MDT Project Management System (PMS) data.

Exhibit III-5 shows overall project duration, based on first and last occurring labor charges from the Detailed Ledger.

Exhibit III-5: Preconstruction Project Duration Based on Labor Charges by Type of Project*

Type of Project	All Projects		Projects not put on hold for 6+ months[1]
New Construct/Reconstruct	Average	9.2	7.9
	Minimum	*1.5*	*1.5*
	Maximum	*13.1*	*11.1*
Restoration/Rehab	Average	4.2	4.2
	Minimum	*2.1*	*2.1*
	Maximum	*7.7*	*7.7*
Resurfacing/Minor Widening	Average	3.8	3.5
	Minimum	*0.3*	*0.3*
	Maximum	*7.7*	*7.1*
Bridge	Average	4.1	3.4
	Minimum	*0.7*	*0.7*
	Maximum	*6.8*	*5.9*
Safety/Traffic	Average	2.8	2.7
	Minimum	*0.3*	*0.3*
	Maximum	*7.5*	*6.2*
Average of all projects	Average	4.4	3.8
	Minimum	*0.9*	*0.9*
	Maximum	*8.6*	*7.9*

*108 Federal Aid Projects Let in 1997/98 and 1998/99
[1]Those projects with gaps in labor activity over 6 months were excluded (see Exhibit III-9 following).
Source: Dye Management Group, Inc. derived from MDT Detailed Ledger Account Data.

Exhibit III-5 illustrates the following with regard to overall project duration:

- As expected, overall project duration is greater than the milestone analysis in Exhibit III-3. This is because the analysis includes Detailed Ledger charges from approval of partial PE, and work after the ready date and prior to advertising.
- When compared against durations from the milestone analysis in Exhibit III-3, there does not appear to be excessive duration involved in activities prior to PFR and activities from the ready date to advertisement.

- As the minimums and maximums show, there can be a wide variation in the time it takes to deliver projects. For example, while the average overall duration of new construct/reconstruct projects is 9.2 years, the minimum time was 1.5 years and the maximum was 13.1 years. Of course the scope of the project involved is a major factor in this variation.
- When gaps in labor activity are removed project durations for new construction and bridge projects are notably lower, confirming that these projects can be subject to significant delay.

- **Considerations.**

  Projects can be subject to schedule delay or simply take a long time to design for a variety of reasons. These reasons include:

  - Unforeseen circumstances, such as environmental conditions.
  - Changes in priorities due to funding availability.
  - Changes in project delivery plans from year to year and within years.
  - When there is a greater volume of work in PMS than can be funded or for which there are resources.
  - Activities that are on the critical path and are delayed because resources are not available when they are scheduled.

b. There are controls in place to ensure that project priorities are consistent.

Analysis of preconstruction project schedule delays raises the question of whether or not MDT is sticking to its priorities. Review of MDT's procedures for priority setting show that there are controls in place to ensure that project priorities do not change. Once a project is programmed it generally remains a priority for design unless external factors cause a delay (such as funding, environmental, public or other project barriers). MDT has a well established priority setting process.

However, where project priorities exceed available funding the delivery plan will be subject to change. In addition, it is important to note that because of the length of time it takes to deliver preconstruction, a number of the projects in our data set were worked on before MDT instituted its current procedures to avoid changing project priorities.

Interviewees indicated that in the past there had been frequent changes in priorities, which had caused work to stop and start. However, interviewees believe that this is no longer a major problem.

4. Are Projects Delivered within Scope?

a. Yes, MDT appears to be excelling at managing scope. For 108 projects analyzed the variance between engineer's estimates at PFR and award amounts was $2.1 million out of $267.8 million.

- **Measurement.**

  The engineer's estimate of the cost to construct is used as an indicator of project scope. Engineer's estimates on federal aid projects let in 1997/98 and 1998/99 were compared over time, between the following milestones, to evaluate whether projects are delivered within scope:

  – Project nomination.

  – Preliminary field review.

  – Scope of work.

  – Advertisement.

  – Actual award amount.

  In addition, we evaluated whether MDT has management controls in place and whether they are exercised.

- **Evidence.**

  The audit data indicate that project scope is generally well managed. Exhibit III-6 below shows the total dollar value of the engineer's estimates on the 108 projects at each major preconstruction milestone.

Exhibit III-6: Scope Change – By Project Type* (not adjusted for inflation)

Type of Project	Engineer's Construction Cost Estimate ($ millions)				
	Nomination	Preliminary Field Review	Scope of Work	Advertisement	Actual Award Amount
New Construct/Reconstruct	$126.2	$175.3	$200.8	$161.4	$154.3
Resurfacing/Minor Widening	52.3	49.2	56.8	57.2	55.5
Bridge	20.5	23.5	23.8	29.4	30.7
Safety/Traffic	12.3	10.4	12.9	6.2	6.0
Total	**$217.6**	**$269.9**	**$310.6**	**$276.6**	**$267.8**

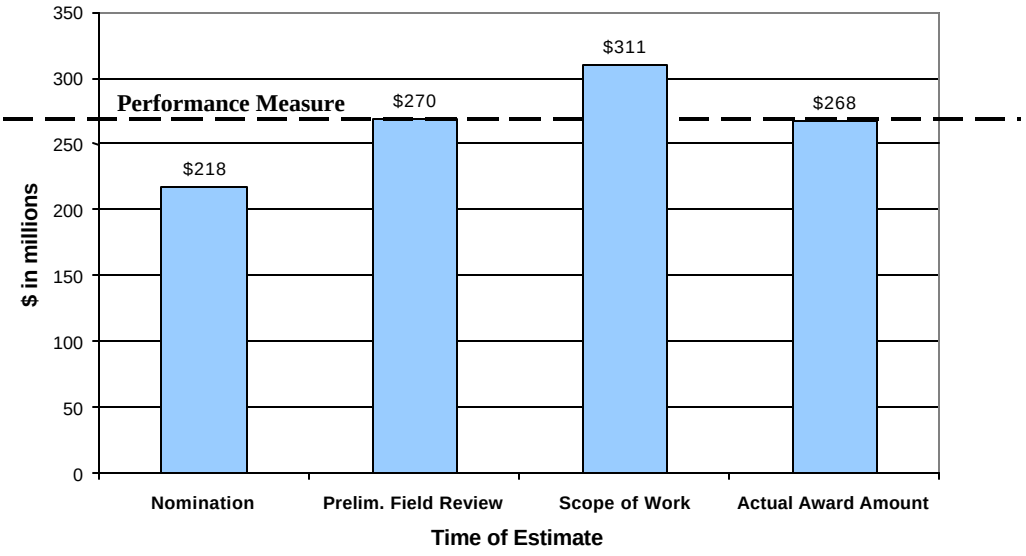
*Based on data available for 108 Federal Aid Projects let in 1997/98 and 1998/1999.
Source: Compiled from data sources provided by MDT Engineering Management

Exhibit III-6 shows the following with respect to scope change:

- For all projects analyzed, the preliminary field review engineer's estimates for dollar value are remarkably close to the actual award amount ($269.9 million versus $267.8 million). This suggests that the STIP is delivering projects very close (at least in the aggregate) to actual award amounts, since the preliminary field review forms the STIP estimate.
- The data also suggest that there are strong controls on scope once the PFR is established and that control is maintained through the scope of work and plan-in-hand milestones.
- There is a sizeable increase between nomination and the actual award. This amounts to about 23 percent. This should not be considered cause for alarm. The average length of time to deliver the projects analyzed was 4.4 years and the average type for the new construct category (the largest value for construction) was 9.2 years. Therefore, a large portion of the increase in cost can be attributed to increases in the cost of construction.

Exhibit III-7 summarizes the total dollar value of the engineer's estimates from construction on the 108 projects analyzed.

Exhibit III-7:
Total of Engineer's Estimates ($ millions)*
(108 Federal Aid Projects Let in 1997/98 and 1998/1999)



*Based on data available for 108 Federal Aid Projects let in 1997/98 and 1998/1999.
Source: Compiled from data sources provided by MDT Engineering Management

b. MDT has in place effective scope management controls.

About three years ago, MDT management established clear policy and management controls to ensure that project scope does not change between preliminary field review, scope of work and advertisement. A committee was established to review any requested scope or priority change for whatever reason. In addition, there are controls to ensure that the nominated category of work does not change unless there is an explicit management decision that it should change.

- **Evidence.**

  The prior data demonstrates effective scope management.

5. Is the Letting Schedule Stable?

a. Many projects have letting date delays and the letting schedule does not appear stable.

- **Measurement.**

  In order to assess whether the letting schedule is stable, minutes from the Department's "Letting Review" meetings were compiled and analyzed to determine how many projects had advertisement dates delayed and by how long. The meetings cover projects that are in about the last six months of the preconstruction process. Any delays at this stage impact the published letting schedule. Planned lettings are generally announced four to six months in advance. Letting Review meeting minutes from October 1998 to September 1999 formed the basis for analysis.

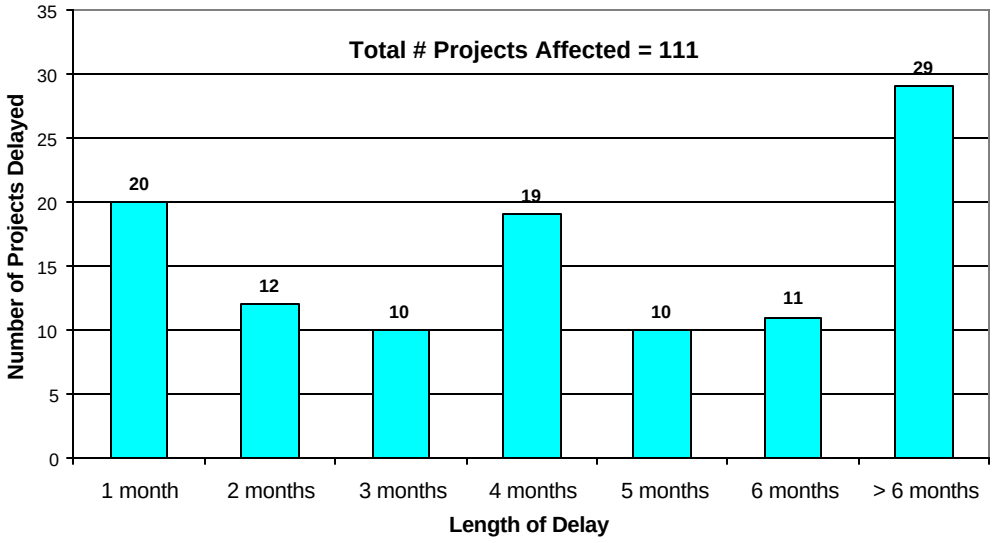
  Analysis elsewhere (Section II) evaluates MDT's performance in delivering projects within their planned delivery year.

- **Evidence.**

  Exhibit III-8 shows the number of projects delayed and the length of letting date delays from letting meeting minutes from October 1998 to September 1999.

  Over 60 percent of projects experience letting delays of four or more months. Letting schedule is highly variable in terms of monthly number and dollar value of projects let. This variation makes workload balancing difficult.

Exhibit III-8:
Number Projects Delayed and Length of Letting Date Delays
Letting Meetings from October 1998 to September 1999



Source: Dye Management Group, Inc. Computed from Letting Meeting minutes provided by the Engineering Management Unit.

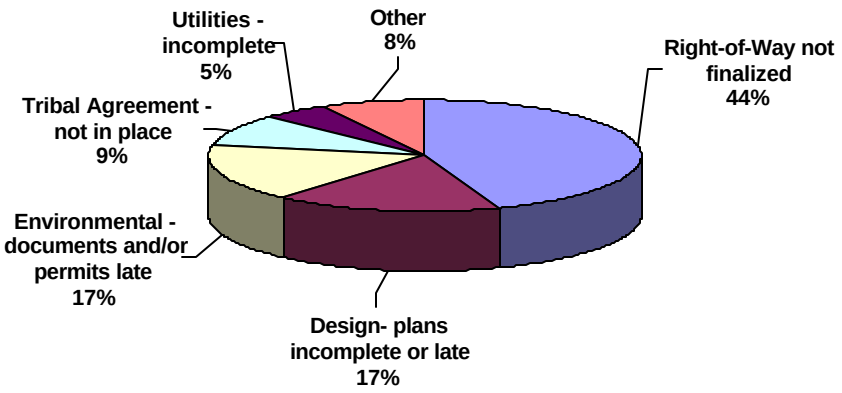
The exhibit shows the number of projects that had total delays to their letting schedule of one month, two months, and so on. For example, 11 projects had their letting date delayed a total of six months. A project in this group could have had two three-month delays that account for this. From October 1998 to September of 1999 a total of 111 projects had their letting dates delayed – some of them several times. Exhibit III-8 reveals the following:

- Twenty-six percent of the projects had letting dates delayed for more than six months.

- Thirty-six percent had letting date delays of between four and six months.

Exhibit III-9 shows the reasons noted for letting date delays as recorded in the Letting Review meeting minutes.

Exhibit III-9:
Reasons for Letting Schedule Delays



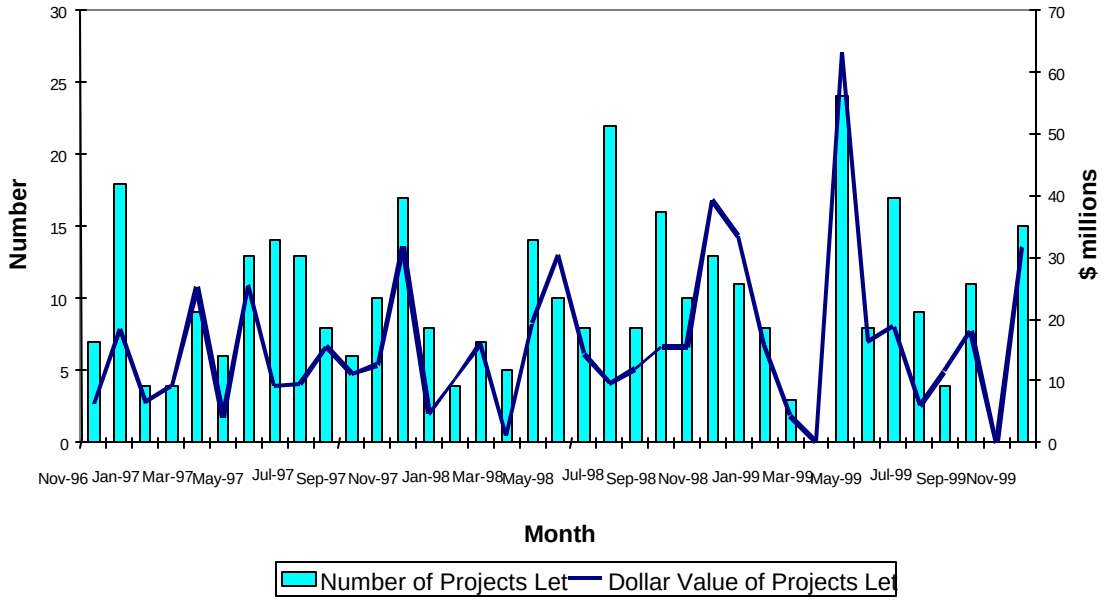
Source: Dye Management Group, Inc. Derived from Letting Meeting minutes 10/98 to 9/99 provided by the Engineering Management Unit

Exhibit III-9 shows that:

- Right-of-way not finalized is the most frequently cited reason for delay of the letting date (44 percent of the time). At this late state of project development most of the projects are in the right-of-way phase. As discussed earlier, delays in prior phases frequently do not leave enough time for full right-of-way activities to be completed.
- Environmental documents and/or permits late and design plans late or incomplete are the next most frequently cited reasons for delay of letting dates (17 percent of the time each). Design work not complete is an issue because design should be close to completion before contract plans start to monitor letting status.

Exhibit III-10 shows the number and dollar value of projects let by month for the last three fiscal years.

Exhibit III-10:
Number and Dollar Value of Projects Let by Month
FY 1997, 1998 & 1999



Source: MDT Contract Plans Unit

Exhibit III-10 illustrates the following with regard to the letting schedule:

- The letting is highly variable in terms of monthly number and dollar value of projects let – some of this is obviously due to the seasonality of construction.
- The variation in work load makes resource leveling difficult for the departments involved with letting.
- It is interesting to note that from July to October of 1998 there was a high number of projects let but the dollar value was low. This is the most notable deviation between the two series.

6. What Is the Quality of the Work Performed and Is Quality Built into the Process?

a. The quality of design work is high, the number and value of design related change orders is very low, 1.0 percent of $172 million in construction.

- **Measurement.**

  The quality of preconstruction projects can be measured in the following ways:

  – Is the project biddable? This can be determined by examining plan amendments and redesign work.

  – Is it buildable? This can be measured by the amount and dollar value of change orders during construction that are attributable to design quality problems.

  – Are procedures in place to ensure that quality is built into the design process?

  Change order data from the Construction Bureau were analyzed for projects let in fiscal year 1997/98 to be consistent with the audit teams' analysis of current federal aid projects. However projects let in fiscal year 1998/99 could not be assessed since they have likely not undergone sufficient amounts of construction to have generated change orders. Aggregate information on change orders is also presented.

- **Evidence.**

  The audit findings indicate that the amount and value of MDT's change orders attributable to design are low, relative to industry standards. This indicates that MDT produces high quality design work. Interview results did not indicate concern about the quality of design work, nor was there evidence that plans are amended or that redesign work is frequently necessary. Our interviews with the Contract Plans unit who are customers for design work indicated that from their perspectives the quality of design is high.

Exhibit III-11 shows the number and dollar value of change orders from projects let in fiscal year 1997/98.

Exhibit III-11:
Change Orders from Projects Let in FY 1997/98
($ million)

Type of Project	Number of Changer Orders	Total Construction Award Amount ($million)	Dollar Value All Change Orders ($million)	Change Order % of Construction Amount	Estimated Design Related Change Orders[1]	
					Value ($million)	Percent of Construction Cost
New Construct/Reconstruct	13	$101.7	$1.9	1.8%	$0.7	0.7%
Restoration/Rehab	4	12.9	0.6	4.7	0.2	1.8
Resurfacing/Minor Widening	10	34.8	0.6	1.8	0.2	0.7
Bridge	12	18.7	1.1	5.7	0.4	2.2
Safety/Traffic	16	4.3	0.2	5.7	0.1	2.2
Total	**55**	**$172.4**	**$4.4**	**2.6%**	**$1.7**	**1.0%**

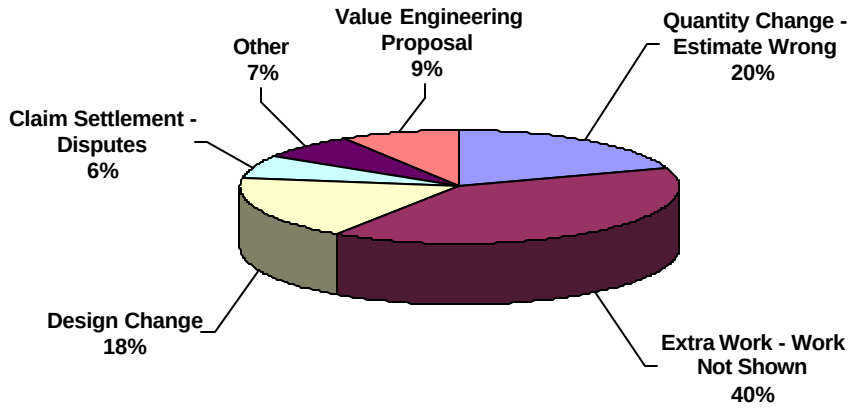
Source: MDT Construction Bureau

The total value of change orders on projects let in FY 1997/98 was 2.6 percent of total construction amount. Design related change orders are estimated at 1.0 percent of total construction amount. This is low by industry standards, although not all work on all of these projects is complete.

Data on the reason for change orders is limited to fiscal year 1997. This data is presented in Exhibit III-12.

[1] Percentage of change orders related to quality of preconstruction work based on 1997 analysis by Construction Bureau. They found that 18 percent of change orders for the fiscal year were directly related to design. Also 40 percent of change orders were due to extra work – work not shown. Based on discussions with the Construction Bureau we assumed that 50 percent of this would be attributable to preconstruction design related oversights/omissions, meaning that design related change orders account for 38 percent of all change orders.

Exhibit III-12:
Fiscal Year 1997 Breakdown of Reasons for Change Orders



Source: MDT Construction Bureau.

The data presented in Exhibit III-12, indicate that 18 percent of change orders are directly related to design changes. Additionally, it should be noted that a portion of change orders based on extra work – work not shown – would also be related to things not included or overlooked in the design process. We cannot know what proportion of change orders this would apply to; however, even if it was 50 percent – making design changes 38 percent of all change orders – the total value of change orders remains low. Similarly, if a portion of the quantity change or claim settlements could be attributed to design quality, the value again remains low.

Historically, MDT has had a relatively low volume of change orders. This is shown in Exhibit III-13, which represents aggregate annual data on change orders as a percent of total contractor payments. Other DOTs in the region have change orders averaging around eight percent of total contracted payments. In 1998 change orders as a percentage of contractor payments were 8.4 percent in Oregon and 8.1 percent in Washington State.[2]

[2] Source: Management Review of Construction and Maintenance, prepared for the Oregon Department of Transportation, Dye Management Group, Inc., 1998.

Exhibit III-13:
Value of Change Orders Included in Contractor Payments,
Fiscal Year 1989 to 1999
($ millions)

Fiscal Year	Contractor Payments	Total Change Order Cost	Change Order Percentage
1999	196.6	$ 6.5	3.3%
1998	168.7	4.8	2.8
1997	166.1	9.6	5.8
1996	172.1	7.9	4.6
1995	146.4	6.4	4.3
1994	146.6	2.9	1.9
1993	135.6	2.4	1.7
1992	135.1	4.0	2.9
1991	154.6	4.2	2.7
1990	133.3	6.9	5.2
1989	117.2	7.0	6.0

Source: MDT Construction Bureau

b. Quality is built into the design process through reviews, procedures for constructability review, and feedback to design during construction.

- **Evidence.**

  Quality reviews are built into MDT's design process as evidenced by the review steps involved with the preliminary field review, scope of work, and various plan-in-hand reviews. Audit team interviews also confirmed that quality review procedures are used between design supervisors and design staff.

  Interviews of headquarters and district preconstruction project staff indicate that MDT has procedures in place for constructability review and feedback during construction. Staff did identify that often times they are busy and that these processes could be improved. The low value of change orders indicates that quality is well managed at MDT.

7. What Causes Schedule Delays? Which Activities Cause Delay and Add Cost to the Design Process?

a. A large proportion, 31 percent of projects analyzed, experienced a gap in preconstruction work of six or more months.

- **Measurement.**

  To measure what causes schedule delay it is necessary to have data on the original planned start and planned completion of activities and then to compare their planned to actual duration. These data are not maintained in PMS, nor could they be derived from other sources. Therefore, the measurement approach taken involved the following analysis:

  – Measurement of the extent to which projects are subject to stops and starts. This indicates how much potential there is to reduce the duration times for preconstruction.

  – Identification of bottlenecks in project delivery through interviews and analysis of phase review reports to identify which activities are most frequently rescheduled.

- **Evidence.**

  Information from the Detailed Ledger was used to evaluate gaps in labor activity on federal aid projects let in 1997/98 and 1998/99. Using aggregate level data it is not possible to determine the reasons for the delay. However, projects can experience stops in labor activity for a number of reasons:

  – There could be a delay as a result of the timing/availability of federal funds.

  – Resources might not be available at critical path points.

  – The project could encounter a barrier such as environmental, public, or political delays.

  – Short range letting schedule priorities might change.

  Exhibit III-14 identifies the longest gaps in labor activity for each of the federal aid projects let in 1997/98 and 1998/99.

Exhibit III-14:
Longest Gap in Labor Activity by Type of Project*

Type of Project	Longest Gap in Labor Activity				
	No significant gap	4 to 6 months	6 months to 1 year	1 to 2 years	> 2 years
New Construct/Reconstruct	8	3	12	2	3
Resurfacing/Minor Widening	10	7	2		
Restoration/Rehab	1	2	1		
Bridge	12	5	6	5	
Safety/Traffic	13	7	2	1	
Misc.	5	1			
Total	**49**	**25**	**23**	**8**	**3**
Percent	*45%*	*23%*	*21%*	*7%*	*3%*

*Based on data available for 108 Federal Aid Projects let in 1997/98 and 1998/1999.
Source: MDT Detailed Ledger Account Data

Exhibit III-14 illustrates the following:

- One-third of federal aid projects let in the past two years had work stop for over six months.
- Eight of the projects had gaps in activity from one to two years – five of these were bridge projects.
- Three of the projects had gaps in activity longer than two years – all of these were new construct/reconstruct projects.

It is important to note that Exhibit III-14 shows only the longest gap in activity. Projects can of course have many other shorter gaps in activity.

Implications of the analysis in Exhibit III-14 are:

- Large dollar volume new construct and bridge projects can experience delays or project barriers, which cause MDT to have to revise project delivery plans.
- There are opportunities to shorten project duration through reducing/ eliminating gaps in activity.
- A significant number of projects lack continuity and experience long periods of inactivity. This is inefficient for a number of reasons. It can

result in more labor time, prior decisions can be reopened, circumstances change, and environmental permits can lapse.

b. It is not clear-cut which activities cause delay.

- **Evidence.**

  Since, as discussed earlier in this section, information is not retained on planned versus actual project schedules it is not clear-cut which activities are causing delay. Ready dates for late activities get changed during Phase Review meetings but a downstream activity can be made late by a late critical path activity before it. There is no way to quantify this from the data available.

  The Phase Review meetings review schedule status for activities at milestones for the end of a phase (survey, design, and right-of-way). To this extent, Phase Review meeting late activities do provide some useful information on which activities are late at the time of design milestones.

c. Preconstruction survey causes schedule delay and adds cost.

- **Evidence.**

  Based on the analysis of planned versus actual labor hours (see Exhibit III-1 earlier in this section), it is clear that preconstruction survey activities are adding cost. The analysis showed that actual labor costs for preconstruction survey were 96.6 percent greater than planned. This may also indirectly provide some evidence that preconstruction survey activities are causing schedule delays.

  Interviews conducted with Area Engineers and Engineering Services Supervisors invariably revealed the concern that preconstruction surveys are late and that this is causing design activities to be late. The interviewees indicated that the problem is that survey work is not performed when needed and that it takes a back seat to construction priorities. (Preconsturction survey is analyzed in much more detail in Section V).

  Analysis of 1998/99 Phase Review reports and meeting notes was used to determine which activities are late at the phase milestones. Exhibit III-15 shows the ten most frequently late PMS activities found in the analysis of Survey Phase Review meetings and the length of time ready dates were delayed.

Exhibit III-15:
Survey Phase Review Analysis*
Ten Most Frequently Late PMS Activities

PMS Activity #	Activity	Management Unit	Number of Times Ready Date Changed	Average Number of Days Delayed	Total Number of Days Delayed
216	Establish Alignment and Grade	Road Design	31	204	6,312
222	Approve Scope of Work Report	Road Design	22	155	3,399
214	Prepare Scope of Work Report	Road Design	21	137	2,885
200	Preliminary Field Review Report	Road Design	21	76	1,604
212	Preliminary Plan Preparation	Road Design	18	245	4,405
734	Wetlands Evaluation & Coordination	Environmental	17	172	2,932
706	Fish & Wildlife, Habitats and Special Resources Assessment	Environmental	14	180	2,520
370	Size Bridge Openings	Hydraulics	13	242	3,141
710	Request Environmental Information/Identify Issues, Concerns, Opportunities	Environmental	13	125	1,627
356	Preliminary Hydraulic Design	Hydraulics	12	216	2,593

*Based on data from Phase Review Meetings from 1/5/99 to 10/7/99.
Source: Dye Management Group, Inc. derived from MDT Engineering Management Unit data.

The exhibit shows that the top five most frequently late activities at the survey phase review meetings are road design activities. All of these activities require a survey to complete. According to Area Engineers, Engineering Services Supervisors, and the Engineering Management unit, late preconstruction surveys are the major reason for the above late road design activities showing up at the survey phase review meetings. In fact, all of the activities that show up late at the survey phase review meetings are dependent on survey information.

d. Environmental and right-of-way activities are consistently late in the Right-of-Way Phase.

- **Evidence.**

  Exhibit III-16 shows the ten most frequently late PMS activities found in the analysis of right-of-way phase review meetings. Since the right-of-way

phase review meetings focus on project milestones near the end of the preconstruction design process, late activities at this point are an indicator of which activities could be causing letting delays.

Exhibit III-16:
Right-of-Way Phase Review Analysis*
Ten Most Frequently Late PMS Activities

PMS Activity #	Activity	Management Unit	Number of Times Ready Date Changed	Average Number of Days Delayed	Total Number of Days Delayed
814	Negotiations for Utility Agreements	Right-of-Way	94	150	14,125
722	Develop Environmental Document (CE, EA, FONSI, FEIS, ROD, SEIS)	Environmental	88	198	5,535
824	Conduct and Complete Negotiations	Right-of-Way	77	143	11,014
728	Environmental Water Quality Permits	Environmental	67	171	11,444
816	Appraise ROW	Right-of-Way	59	204	12,037
744	Prepare Submit and Coordinate Storm Water Permits	Environmental	49	114	5,579
740	Final Environmental Review	Environmental	48	89	4,265
836	ROW Plan and Deed Revisions	Right-of-Way	44	143	6,298
732	Compliance with Stream Protection Act	Environmental	29	143	4,134
752	Biological Impact Analysis	Environmental	26	281	7,308

*Based on data from Phase Review Meetings from 1/5/99 to 10/7/99.
Source: MDT Engineering Management Unit

The exhibit shows the following about late activities in the right-of-way phase:

- Environmental and right-of-way activities make up the top ten most frequently late activities for the right-of-way phase. Interview results indicate that the reason for many of the delays in the right-of-way activities are due to survey not being completed in time to allow subsequent activities to keep on track.
- These activities involve completion of documents/analysis, negotiation of agreements, and obtaining of permits – all of which can cause

delays at the end of the preconstruction process. Lateness of these activities could also be a major factor in letting delays.

(The environmental process is examined in much greater detail in Section IV of this report.)

e. The traffic engineering review function performed in Helena is viewed as causing bottlenecks in project delivery.

- **Evidence.**

  The traffic engineering review function is widely viewed as causing delays in project delivery based on interviews conducted in Helena and in the districts. The traffic engineering unit reviews all plans that relate to intersections, left turn lanes, signage and markings. The traffic engineering work load has increased significantly in recent years.

  Consequently, staff in the traffic engineering unit have a backlog of work that causes delays in preconstruction project delivery. The districts have expressed concern that there is no single point of contact in the traffic unit for each district. This often makes it difficult for the districts to determine the status of designs being reviewed by the traffic engineering unit.

  Interviewees expressed concern that routine traffic engineering designs are being "redesigned" each time in Helena and that more authority could be given to the districts which would expedite design. Interviews at Helena and in the districts revealed concerns that many routine traffic engineering designs such as standard intersections, left turn lanes, signage and markings are being redesigned each time by the traffic engineering unit in Helena. It may be possible to use standardized "templates" for many of these designs, thereby improving efficiency and reducing costs. Also more authority could be given to the districts to undertake more routine traffic engineering designs, which would also help to expedite the design process.

- **Considerations.**

  This issue needs to be addressed carefully. Traffic engineering requires specialized expertise and experience. Further, it is important that there is a consistent application of design standards throughout the state. Care needs to be taken in delegating authority while maintaining quality control and review. This is important given risk and liability issues.

8. Does MDT Have Efficient and Effective Management Controls, Accountability Structures and Organization for Project Delivery?

a. MDT's organizational structure for project management has evolved but needs to go further, strengthening the role of project managers.

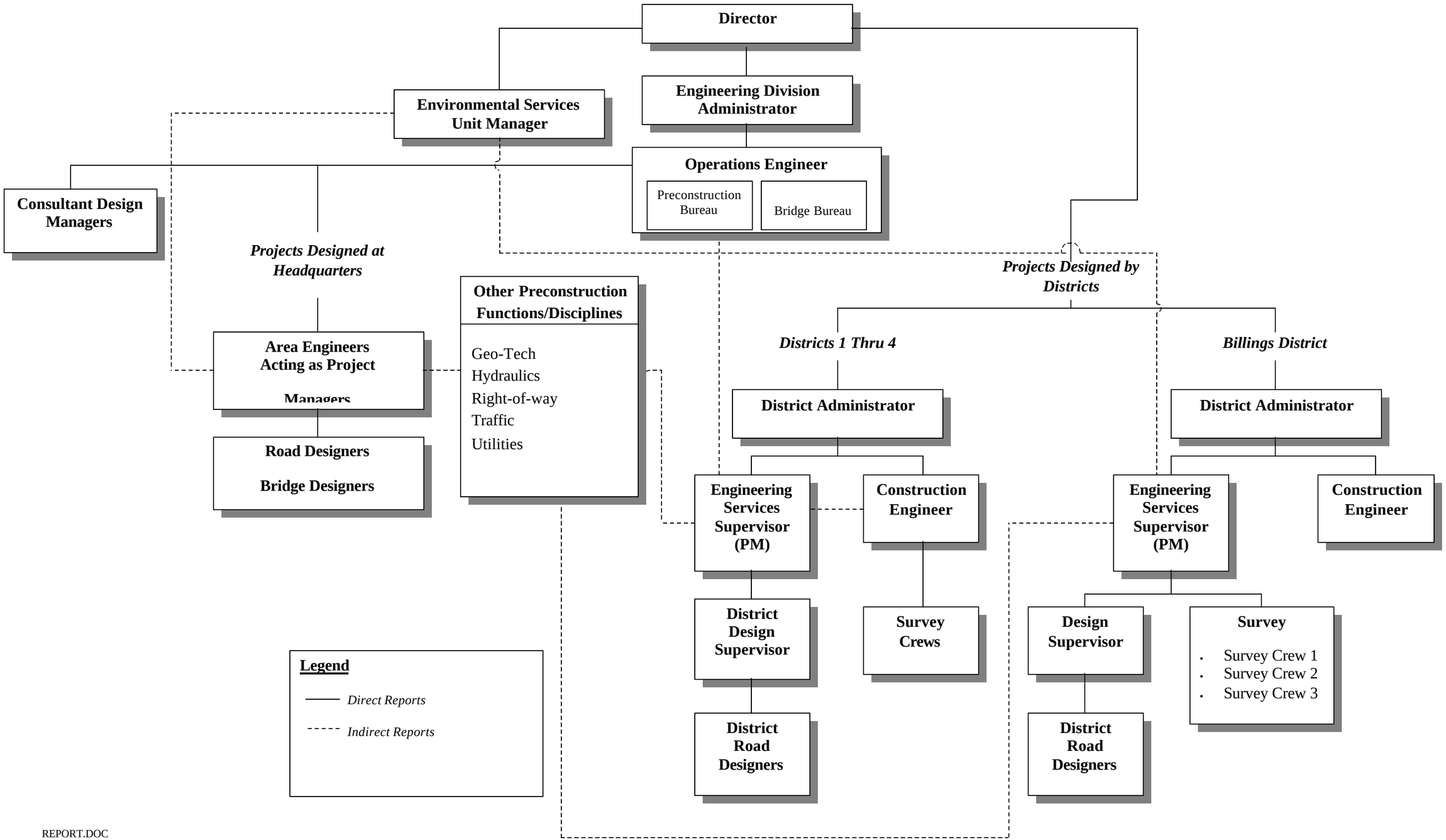
MDT has recognized the need to strengthen the role of project managers and has made steps in recent years toward this end. Findings of this audit suggest that further strengthening of the role of project managers is necessary. Specifically, project managers should be responsible for scope, schedule, budget, and quality for project design in addition to responsibility for project completion.

Analysis of MDT's management controls, accountability structures and organization along with audit team interviews revealed the following findings:

- **Project management responsibilities are fragmented across functional areas and districts.** For example, an area engineer on a project does not have any direct responsibility for, or authority over, schedule for environmental activities, survey or right-of-way. These include many of the activities that the prior analysis indicates are causing delay. New position descriptions for area engineers and engineering services supervisors have broadened their responsibility for project management, but the responsibility focuses on schedule, and there is little authority over all areas of preconstruction.

  The current situation is presented in Exhibit III-17 and can be categorized as a "weak matrix" management approach.

Exhibit III-17: MDT's Current Functional Organization For Preliminary Engineering



The exhibit shows the following is occurring:

- Area Engineers, although reclassified as project design managers, are held accountable for the schedule of design activities.
- Responsibility and authority for schedule resides with functional managers: survey, traffic, right-of-way, environmental, etc.
- The survey function has a weak reporting structure to project managers and is inconsistent within the organization.
- There is some functional overlap between district/headquarters (right-of-way and traffic, for example).

- **MDT has elevated the project management function through updated position descriptions but still has a fairly weak project manager structure.** New position descriptions have been created for road design area engineers and district engineering services supervisors that strengthen their project management responsibilities. This has not taken place in Bridge Bureau. The new position descriptions only go so far in terms of broadening the project management role. The Area Engineers do not all see themselves as project managers, and to differing degrees act as project managers responsible for the schedule performance of all preconstruction activities.
- **The project management culture is focused on schedule for design work; it needs to be broadened and strengthened to address budget, scope, and quality.** MDT's project management culture is focused on schedule for design work, especially since the increased program brought about by TEA-21. This is evidenced by the use of Phase Review meetings, Letting Meetings, and District Design Coordination meetings – all intended to enforce and advance project schedules. The audit team found little evidence that project managers are aware of and/or monitor preconstruction budgets, scope, and quality. Further, there are no management controls ensuring that project managers are responsible for these components. The project management culture needs to be broadened and strengthened to include all activities and address budget, scope, and quality.

b. The district preconstruction interviewees are often unclear about the preconstruction project delivery plan.

One concern consistently expressed during interviews with project managers at headquarters and in the districts is that they are often unclear about what the project delivery plan is. The link between the Redbook, PMS and the letting schedule is not clear to them. Project managers need frequently updated information on planned projects, progress against projects underway, funds obligated by category, and remaining fund balances by program category.

9. Does MDT Have the Necessary Tools and Procedures for Managing Preconstruction Project Delivery?

a. The current Project Management System is limited in its effectiveness as a project management tool.

MDT has recognized the need to replace the current PMS and is undergoing a review of requirements for this new system in parallel to this audit. Since the PMS system plays an important role in the management of MDT's preconstruction projects, the audit team evaluated the project management issues that flow out of the current system.

MDT relies on its PMS to help manage the completion of preconstruction tasks. PMS is a mainframe critical path network program that has been adapted from New Mexico's model. The Department's Engineering Management Unit operates and maintains PMS.

One network is used for all types of projects designed by MDT and one network is used for all projects designed by consultants. The network is divided into three phases: the survey phase, the design phase, and right-of-way phase. Major milestones within the network include completion of the preliminary field review, the scope of work report, final plans review, and the ready date. The ready date is the end of a project's life in PMS as plans are then forwarded to Contract Plans to receive final checks, develop bid packages, and advertise the projects.

Planning values for project activity hours and durations have been estimated from historical data for different project types. These planning values are updated about every two years. The Engineering Management unit provides new estimates and management meets to either adopt or revise the estimates. These estimates form planning values for activities, which management units can override if they anticipate the activity taking a shorter or longer period of time. When an activity is completed it is "carded out" on the PMS system. Phase review meetings are held every month or so to revise task completion dates for late activities identified by PMS.

The following limitations of PMS were identified through audit team review of the PMS manual/network and interviews with preconstruction project staff:

- **PMS does not retain planned schedule information.** Among the project management limitations is that it is not possible to track original schedules against new ready dates.
- **PMS does not do multi-project, multi-year resource leveling.** The current system only distributes man-hours across one project. Management units involved in preconstruction are working on several projects at one

time. The current system does not allow management to examine how its resources are being utilized across these multiple projects. This is an important requirement for the management unit to be able to allocate unit resources and to determine if adequate resources are available to undertake what has been programmed.

- **PMS is used primarily for federal aid projects.** Generally the projects programmed in PMS are federal aid projects which have a budget established by the federal agreement. Some, but not all, state-funded projects are programmed in PMS, but they do not have a budget. Preconstruction activities on these projects are often not charged to the project but to a general state-funded projects charge code.
- **Actual data suggests that, for many activities, PMS planning values are inaccurate.** Data presented in the previous section on Project Management Performance showed that, while the Department is accurate in budgeting PMS labor hours for design, the planning values for survey and right-of-way are significantly underestimated. Environmental planning values are overestimated.
- **There is nothing to prevent a management unit from "carding out" an activity when, in reality, it is not complete.** Management units are responsible for carding out when an activity is complete. If an activity is late, that management unit will have to provide an alternative date at a phase review meeting and may have to give an explanation.
- **Limited data is retained for performance measurement and benchmarking.** The current system is a dynamic critical path system that, once changed, does not retain old information. This makes analysis of project durations and labor hours difficult. Some information is being obtained manually at the present time but it is insufficient for providing the management information required to strengthen project management tracking.

b. Procedures, policies, and tools can be further enhanced to strengthen project management.

Preconstruction project procedures and policies appear in the Road Design Manual, the PMS Manual, and the Consultant Design Manual, amongst others. Based on the audit team review, these manuals provide the required information and appear to be updated periodically. It is important to keep all of these documents current.

One tool that would be useful would be a procedures and policies manual specifically on how to manage preconstruction projects. It could include check-lists, sign-off sheets and so on. This could form an overall framework document for project managers to manage preconstruction projects across all activities.

c. Districts are not always clear on current policies, procedures, and standards set in Helena as they often are changed.

From time to time interim changes are made to design specifications, policies and procedures. These are often handled by way of memos or directives. According to audit team interviews, designers in Helena and, in particular, in the districts, are not always clear that they are alerted to and have all changes to standards, policies and procedures. The volume of these changes makes the problem even more significant.

Procedures are needed to ensure that designers both in Helena and in the districts are alerted to and are up to date on all design specifications, policies and procedures.

F. Recommendations

This section presents recommendations to enhance and improve project management and delivery based on the audit findings in this area.

Recommendation III-1. Elevate the importance of project management by establishing a strong matrix management approach for project delivery.

- **Take the organizational steps to establish a strong matrix management approach for project design management. This should include bridge, roadway, consultant design, and other applicable "design projects".**
- **Make these project managers accountable for schedule, budget and scope for all phases from preliminary field review through to the delivery of final road plans.**

This recommendation requires that MDT take the next steps to establish a preferred organizational model for project management. Currently, MDT appears to be transitioning from functional management to a "weak" matrix management approach. It will benefit MDT to specify a preferred model and the issues that need to be addressed in moving towards it. We recommend that a similar model and procedures be used across all types of projects (bridge, roadway, safety, etc.).

Implementation Steps:

1. Develop a clearly defined matrix management structure that will work for MDT.
2. Define roles, responsibilities, and accountability structure and mechanisms within the model.
3. Use the outcome from implementing the other recommendations to provide the policies, procedures, tools, and training to institutionalize the project management structure.

Recommendation III-2. Strengthen project management culture through:

- **Communicating management objectives and providing program delivery status reports to line managers.**
- **Including achievement of project delivery objectives in performance plans of line managers in the Engineering Division, Environmental Services Division, and Districts.**
- **Providing periodic training on MDT's project management approach.**
- **Providing communications and training on procedures, policies, and tools that support accomplishment of project delivery objectives.**
- **Facilitating the exchange of information on approaches and initiatives that improve project management performance.**

Implementation Steps:

1. Implement prior recommendations and involve line managers in their implementation.
2. Define project delivery performance expectations for line managers and address in their performance plans.
3. As part of regular cycle of meetings, communicate objectives and show how the measures will be used.
4. Establish mechanisms for disseminating techniques and approaches that have improved project delivery performance.
5. Incorporate project management objectives into MDT's values, policies, and procedures.

Recommendation III-3. Address bottlenecks arising from traffic engineering review function currently performed in Helena. Assess potential for shifting some design decisions to project managers.

- **Establish single points of contact for traffic review for each district.**
- **Review staffing requirements of traffic review unit.**
- **Identify where authority for design decisions can be provided to project managers (Helena and districts).**

These recommendations are intended to reduce the amount of review and approval and provide project managers with more authority. Additionally, the recommendation suggests that the potential of productivity gains from reducing redesign of routine traffic designs be examined. Then based on this analysis, an evaluation should be made on whether additional traffic engineering staff is required.

Implementation Steps:

1. Review traffic review function and establish single point of contact reporting structure by district.
2. Examine workload and productivity for traffic review function to determine if more staff are necessary.
3. Identify opportunity for providing project managers' authority for standards design decisions through the use of standard plates, etc.

Recommendation III-4. For complex projects, prior to preliminary field review, establish a project team approach for project delivery involving all the applicable MDT disciplines and external agency and organization representatives.

This recommendation is designed to establish procedures and additional work steps for developing complex projects through a project team approach. The intent is that this approach be used on projects where by the PFR stage it is clear there are major stakeholder, interagency, and other issues to be addressed during project delivery. The project team approach will build support and will enable design solutions to be reached more quickly.

Implementation Steps:

1. Establish policy and procedure for project teams.
2. Define work plan breakdown for project teams.

Recommendation III-5. Strengthen the procedures and tools that support project management.

- **Conduct expedited improvements to the Road Design Process and PMS flow chart, activity descriptions, and procedures. (These revised business roles can be used as part of requirements definition work for the new project management system).**
- **Develop a project delivery management and procedures manual that: incorporates changes, specifies roles and responsibilities, provides checklists, and details products or outcomes for each activity.**
- **Ensure that policies, procedures, and standards as updated are always current and implemented in the districts.**
- **Provide on-line updates to policies, procedures, and standards.**
- **Ensure that districts are alerted to changes in policies, procedures, and standards.**

This recommendation is designed to make improvements to the current process flow and critical path diagrams used in PMS and the Roadway Design Manual. This should be accomplished through conducting some expedited work sessions to identify and make the improvements and not by embarking on a reengineering project. The new consultant design

manual already includes some changes that MDT staff believe should apply to the process for MDT-designed projects.

The project delivery management and procedures manual will provide in a single document project management information for use by project managers. It also will address all functional areas including: roadway design, right-of-way, utilities, survey, environmental, etc.

Additionally, this recommendation seeks to ensure that the districts receive timely information on changes to polices, standards, and procedures. This is critical to minimize errors and guarantee department-wide consistency in project delivery.

Implementation Steps:

1. Conduct work sessions with process participants to identify improvements to process.
2. Develop work-in-progress draft process flows.
3. Conduct work sessions to develop a draft final flow.
4. Communicate with and obtain input from applicable business areas.
5. Develop and draft procedures.
6. Finalize documentation and incorporate into policy and procedural manuals.

Recommendation III-6. Improve the monitoring and management accountability systems for project delivery through:

- **Establishing preliminary budgets for all projects, tracking, and reporting budget to actual expenditures.**
- **Providing a management tool that includes resource management scheduling for managers to use.**
- **Including budgets for state funded projects in the PMS.**
- **Strengthening procedures and systems for project cost, scope, and schedule control.**
- **Holding project managers and management accountable for cost, scope, and schedule variances.**
- **Reporting changes in scope, cost and priority, and providing an approval mechanism.**

This recommendation involves establishing stronger project management controls and accountability measures for project design. It will establish measures and procedures for applying and using them, and for establishing preliminary engineering budgets, schedules, and scope that project managers will then be held accountable for meeting.

Implementation will require procedures and controls for making planned adjustments to project delivery objectives. It will also require determining how project managers will be held accountable.

Implementation Steps:

1. Establish procedures for establishing agreed scope, schedule, and budget that project managers will commit to meeting.
2. Define procedures for reporting progress against scope, schedule, and budget, and control mechanisms for adjusting these.
3. Design and implement accountability mechanisms.

Recommendation III-7. Prepare for and implement a new project management system.

- **Define requirements based on implementation of prior recommendations.**
- **Ensure that product has true multi-project resourcing capabilities.**
- **Select project management application.**
- **Implement selected application.**

MDT has already recognized that the current PMS needs to be replaced with a new application that can better support project management. This recommendation strongly endorses MDT's decision. However, we recommend that the other recommendations are considered and implemented first. This will result in a well defined set of project management requirements that can then guide the selection and implementation of a new project management tool.

It is important that this recommendation is implemented only after MDT has improved and further defined how projects are to be developed and managed and the type of information that project managers and senior management require for improved program and project management.

Implementation Steps:

1. Define requirements for project management information. Include both project and program-level status reporting, work planning and management.
2. Evaluate and select new project management application.
3. Prepare and execute implementation plan.

IV. Environmental Process

■

G. Introduction

This section presents the findings and recommendations from an evaluation of MDT's management and performance in undertaking the environmental activities that are part of preconstruction project delivery.

1. Background

a. Regulatory environment.

MDT's preconstruction project delivery process must meet the requirements of a complex set of federal and state environmental laws and regulations. There are over 15 major federal "environmental laws" and regulations that affect the preconstruction process. These include the following:

- National Environmental Policy Act (1970), with associated procedures and guidelines.
- Endangered Species Act.
- Clean Water Act.
- Clean Air Act and Clean Air Act Amendments.
- Historic Preservation Act.
- Native American Grave Restitution Act.
- Rivers and Harbors Act.
- Section 4(f) of the 1966 Transportation Act.
- Farmland Protection Policy Act.
- Environmental Justice (Federal Executive Order).
- National Pollution Discharge Elimination System and Non-Point Runoff Programs.
- Federal Aid (transportation) to local governments, Federal Highway Environmental Program Oversight.
- U.S. Forest Service and Bureau of Land Management Environmental Requirements.
- Surface Transportation Acts, Congestion Management Air Quality Program.
- Historic Preservation Act.

There are also extensive state requirements such as the Streambed Preservation Act administered by the Montana Department of Fish, Wildlife and Parks.

Many of the environmental laws and regulations that affect preconstruction, such as the National Environmental Policy Act, have been in place over 20 years. MDT has built into its preconstruction process and practices the work activities, procedures, and standards to meet these requirements and reduce environmental impacts. Regulatory oversight of these practices is performed by other state and federal agencies with differing, and at times competing, mandates and priorities than MDT. The environmental process performed by MDT provides procedures for addressing these regulatory requirements.

b. The environmental process.

The purpose of the environmental process is to assess a project's possible and probable impacts on the environment. This assessment and the resulting documentation are required for qualification for federal funding and in some cases, satisfaction of state regulations.

Every project must go through some form of environmental analysis. Federal regulations require projects be classified in one of three environmental classifications. Each classification then dictates the level of assessment to take place and the type of environmental document that must be prepared. These requirements are summarized in Exhibit IV-1 below.

Exhibit IV-1: Environmental Documentation Classifications and Requirements

Classification	Reason	Document	Notes
Class 1	Actions that significantly affect the environment	Environmental Impact Statement	• Highest, most detailed level of analysis
Class 2	Actions that do not individually or cumulatively have environmental impacts	Categorical Exclusion	• Takes on several forms and ranges in complexity • Must provide enough analysis to demonstrate no significant impacts
Class 3	Actions for which the significance of the environmental impact is not clearly established	Environmental Assessment	• Documentation limited to those areas that have potential for significant impacts, but where affects are unknown • If significant impacts will occur, then an EIS must be prepared.
4(f)	• Minimize harm • No feasible alternative	4(f)	• Completed in addition to other documents when a publicly owned park or recreation area, wildlife refuge, or historic site may be affected
		Finding of no significant impact	No additional analysis is required

The Environmental Services Unit of MDT has the primary responsibility for identifying regulatory environmental requirements, producing the appropriate environmental documentation, and obtaining necessary environmental permits for each project.

The environmental process essentially consists of three stages:

1. The first is the initial scoping of a project during the Preliminary Field Review (PFR). At this stage, potential environmental impacts are identified and an estimate of the hours and dollars needed to complete all future environmental work is developed.

2. The second stage is the assessment of potential impacts and preparation of the appropriate environmental documentation. Each action requires a level of environmental analysis based on the significance of environmental impacts resulting from the project. Proposed mitigation measures are identified during this stage.

3. The final stage is the development of contract details for mitigation measures and acquisition of necessary environmental permits from state and federal regulatory agencies. The number of permits will vary depending on the number of resources affected by the project. No permits may be necessary if there are no significant impacts to resources.

2. Audit Questions

The audit questions answered in this section are:

- Are MDT environmental functions causing delays to the preconstruction process and the letting schedule?
- Is adequate time currently planned to complete environmental tasks?
- Are environmental functions for preconstruction projects adequate to satisfy all necessary regulatory requirements? Is more being done than necessary to meet minimum regulatory requirements? If so, what is being done, and why?
- What are the requirements for external agency input for preconstruction projects and are they creating a time variable outside of MDT control?
- What are the requirements for timely public involvement input into preconstruction projects, and are they being met?

Each of these is addressed in turn.

3. Approach

The approach taken to evaluate the issues addressed by the audit questions involved the following:

- **Interviews with MDT, FHWA, and Montana resource agencies' staff.** The purpose of the interviews was to obtain input on the audit questions and to help assess how things work in practice. Individual interviews were held with MDT staff involved in the environmental process. This included the manager, bureau supervisors, and each of the environmental project engineers in the Environmental Services Unit. Additional MDT staff interviews included selected engineering design personnel from the districts and Helena preconstruction design offices.

  Interviews were also held with representatives from state and federal resources agencies that have regulatory authority and review responsibilities for protection of environmental resources and the granting of environmental permits. Federal Highway Administration staff from the division office in Helena were also interviewed in connection with their environmental review and concurrence responsibility with federal regulations for federal funding.

- **Evaluation of documented policies, and procedures.** Documented policies and procedures were reviewed. This included published guidelines for public involvement, the new consultant design manual, and other sources that document MDT's procedures for performing the environmental activities in preconstruction project delivery.

- **Evaluation of data provided from management systems.** Data from the PMS, Detailed Ledger, construction letting schedules, phase review meeting schedules and notes, and various in-house MDT documents and stand-alone systems were reviewed and evaluated.

H. Findings and Conclusions

1. Are MDT Environmental Functions Causing Delays to the Preconstruction Process and Letting Schedule?

a. Late environmental activities are pushing back ready dates and causing delays to the preconstruction schedule.

- **Many environmental activities are scheduled by PMS late in the development of a project.**
- **Between October 1998 and September 1999, incomplete environmental documents or lack of permits caused 17% of letting schedule delays.**

- **Measurement.**

  Phase review meeting notes were evaluated and all ready date changes due to delays in environmental activities were tabulated.

- **Evidence.**

  Analysis of Phase Review meeting notes between January 1999 and October 1999 indicate that incomplete environmental activities (700 series) have resulted in delaying the ready dates on several projects as shown in Exhibit IV-2.

Exhibit IV-2: Number of Changes to Ready Date and Average Days Ready Date Delayed due to Environmental Activities, January to October 1999

Activity and Number	Survey		Design		Right-of-way	
	Changes	Avg. days of delay	Changes	Avg. days of delay	Changes	Avg. days of delay
706 – Fish and Wildlife, Habitats, and Special Resources Assessment	14	180				
710 – Request Environmental Information/ Identify Issues, Concerns, Opportunities	13	125				
722 – Develop Final Environmental Document			28	198	88	198
728 – Environmental Water Quality Permits			8	145	67	171
732 – Compliance with Stream Protection Act					29	143
734 – Wetlands Evaluation & Coordination	17	172				
740 – Final Environmental Review					48	89
744 – Prepare, Submit, and Coordinate Storm Water Permits					49	114
752 – Biological Impact Analysis			13	212	26	281
Totals	**44**	**161**	**49**	**193**	**307**	**166**

Source: Phase Review meeting notes, Dye Management Group, Inc. analysis

Delays have occurred during all three preconstruction phases. They are most prevalent during the right-of-way phase when the ready date can frequently impact the letting of a contract. Projects are especially delayed during the later phases of development; early delays could have some impact on delays occurring later in project development (i.e., Activity 722, where the 198 days of delay during right-of-way can be partially attributed to the 198 days of delay during design).

b. Environmental activities are scheduled late in PMS.

- **Evidence.**

  The PMS schedules key environmental activities late in the Design Phase and the Right-Of-Way Phase. The scheduled late start is further compounded when unforeseen issues arise and force delays of these activities. As shown in Exhibit IV-2, the due dates for preparation of the final environmental document (722) and acquisition of key permits

(728)(732)(744) are some of the most common activities that are late. When delays occur to these activities, ready dates are forced to slide.

It should be noted that the environmental activity causing the most delays during the Right-Of-Way Phase was activity 722 (develop final environmental document), even though this activity, according to PMS, is scheduled to be completed during the Design Phase. Many times these delays can be significant. The average delay identified for each activity is, in most cases, longer than 120 calendar days (four months).

There are many reasons why these activities are being delayed. The major reasons identified by this audit are that environmental activities need to be started earlier in the process, work planning and project management can be more effective, and a number of the factors affecting completion of activities are outside of MDT's control.

- MDT has recognized the need to begin environmental activities earlier. The Consultant design manual includes procedures for preparing environmental documents earlier in the process. This approach could be extended to all projects.
- Starting environmental activities earlier will require a clear understanding of the project detail required to meet FHWA and resource agencies' requirements.
- Opportunities for reducing the duration of environmental activities, better work planning, and project management are addressed later.

c. The accountability for environmental functions is disconnected from other project development activities causing schedule delay.

- **Measurement.**

  Project management policies and procedures were assessed. Interviews identified how business is conducted in practice.

- **Evidence.**

  Accountability for the on-time delivery of environmental activities lies outside of MDT's current preconstruction project management. Road Design Area Engineers and the district Engineering Services Supervisors are substantially responsible for most aspects of engineering design. These offices do not prepare the environmental documentation or obtain environmental permits required for a project before a contract can be let. These responsibilities are handed off to the Environmental Services Unit, which is then responsible for the scheduling and completion of the environmental activities.

This disconnect results in a situation in which many of the design project managers do not have a developed understanding of what is required to satisfy environmental regulations. In turn, the Environmental Services Unit's principal priority is satisfying regulatory requirements first and then meeting project ready dates. Our interviews and analysis indicate that the Environmental Services Unit's responsibility is to provide environmental documentation that meets regulatory requirements and to obtain concurrence from FHWA. FHWA confirms that MDT provides high quality environmental documentation. In recent years, FHWA approval of an environmental document has never been denied for lack of sufficiency, but the Design Phase ready date has been delayed 88 times between January 1999 and October 1999 because the final environmental document was not complete.

d. Changes to the preconstruction delivery plan, the letting schedule, and perceived uncertainty over the delivery plan contribute to delays in completing environmental activities.

- **Measurement.**

  Analysis presented in Sections II and III demonstrates uncertainty over the delivery schedule. During interviews employees identified the impacts of this on their work.

- **Evidence.**

  Interviewees indicated that one of the factors that affects their work planning is changing program and project delivery priorities. Interviewees pointed to the mismatch between the Redbook plan and the projects that get delivered as an example. It appears that the use of PMS to set work priorities is not as institutionalized within the Environmental Services Unit as in other functional units responsible for preconstruction activities. Employees do not believe the data is good for the environmental activities. It appears that there is a certain amount of "stop and start" on some projects and management to the letting schedule, not the PMS ready date.

  Although audit findings indicate that "scope creep", resulting in higher construction costs, is negligible, there remains a perception with Environmental Services Unit staff that scope changes during project development are creating unanticipated environmental impacts. A small change can have a significant impact on an environmental resource and must be assessed. Changes in scope do not necessarily alter ready dates; however, the effort required for maintaining the ready date schedule typically does change. In the past, MDT has changed projects late in the design process. This can be especially critical when permits must be obtained from resource agencies, and agreements are reversed because of newly identified impacts.

e. Project delays after environmental approval create rework.

- **Over 11% of all environmental documents required for projects within the last two years required some additional analysis after the initial approval.**
- **Evidence.**

  Environmental data for delayed projects can become outdated. Audit findings (see Section III) indicate that the preconstruction project development process takes on average over four years from PFR to ready date for projects. New construction/reconstruction projects take longer, at seven years. Over 31 percent of projects had work stop for over six months. Some projects get rescheduled out of necessity for funding reasons. The complexity and changing nature of environmental regulations also cause delay.

  Any project that is delayed for an extended period needs to be reevaluated to make sure that it meets the latest rules and regulations. Nearly 11 percent of all environmental documents required for projects let between November 1997 and October 1999 required reevaluation after an initial document was approved. An environmental document, by regulation, must be reevaluated if substantial time has elapsed since the initial environmental review was completed, typically no more than three years, but may be more frequent if the analysis does not address current regulations. Delayed projects can also make permit applications incomplete or inaccurate because environmental data is outdated and not acceptable to resource agencies.

2. Is Appropriate Time Currently Planned to Complete Environmental Tasks?

a. The majority of environmental activities in PMS are assigned more time than is normally required to accomplish them.

- **Only three projects out of 108 reviewed used within 10% of the planned hours.**
- **There is little active "project management" for environmental activities; PMS durations are rarely overridden and PMS is not actively used.**
- **Measurement.**

  Planned labor hours were compared to actual labor hours for 108 projects advertised in the 1998 and 1999 federal fiscal years.

- **Evidence.**

  There is little active "project management" for environmental activities, PMS durations are rarely overridden and PMS is not actively used. The duration of environmental activities is dependent on the sensitivity of the resources that will be impacted by the project. PMS has no way of predicting the number of sensitive environmental issues on a project. PMS does allow for adjustment of activity hours by inserting overriding values, but PMS data shows this is not typically done. The planning duration for Activity 722 (develop final environmental document) was overridden less than 15 percent of the time, but Activity 722 should have one of the largest variances of any environmental activity.

  The majority of environmental activities in PMS are assigned more time than is normally required to complete them.

Exhibit IV-3: Planned to Actual Labor Hours for Environmental Activities

	Total	Percent
Number of Projects	108	100.0%
Used less than 50% of planned hours	88	81.5%
Used within 10% of planned hours	3	2.8%

Source: Analysis of PMS data

Exhibit IV-3 shows that out of 108 projects reviewed, only three used within 10 percent of the planned hours and 88 used less than 50 percent. It is noted that MDT has only added environmental activities to PMS within the last two years, and historical estimates for completion of environmental activities have been high. The override values are used very little, therefore the future planning values will be no more accurate.

Each environmental activity has a duration assigned to it, which is then input to PMS. Engineering activity durations are based on project type and length, using historical data. Although this criterion does provide some insight on project complexity, it does not necessarily identify timelines for environmental activities. Each project, even similar types of projects can be significantly different. Potential environmental impacts determine what environmental analysis will be required on a given project, and that may have no correlation to project type or length. Consequently, most projects are planned with more than sufficient time to complete environmental analysis and documentation.

3. Are Environmental Functions for Preconstruction Projects Adequate to Satisfy All Necessary Regulatory Requirements? Is More Being Done Than Necessary to Meet Regulatory Requirements? If So, What Is Being Done and Why?

a. The Environmental Services Unit prepares high quality documents.

- **Measurement.**

  The approach taken to evaluate these audit questions was to analyze the quality and extent of the work performed to meet regulatory requirements. Indicators of quality for environmental activities tend to be qualitative. The indicators used include:

  - Determining whether environmental documents need rework.
  - Obtaining input from regulatory agencies.
  - Assessing the type of environmental documents produced.

- **Evidence.**

  Federal regulations established in 23 CFR 771, identify the technical standards for preparation of environmental documentation for federally funded projects. MDT produces high quality documents. Documents receive a quality assurance review by the Environmental Services Unit before they are transmitted to FHWA. The Helena District office of FHWA monitors MDT for compliance to federal standards.

  In addition to doing the analysis and preparation of documentation to meet NEPA regulations, MDT must also acquire construction permits from state and federal resource agencies. FHWA confirms that MDT provides high quality environmental documentation. In recent years, FHWA approval of an environmental document has never been denied for lack of sufficiency, but the Design Phase ready date has been delayed 88 times between January 1999 and October 1999 because the final environmental document was not complete.

b. MDT is risk averse, and has set high standards for quality and thoroughness, and provides more, rather than less information, to obtain FHWA concurrence and meet environmental objectives.

- **Evidence.**

  Categorical exclusions, which require the least amount of documentation make up the majority of the documents completed by MDT. Exhibit IV-4 below shows the class of environmental document prepared for MDT

projects that were let, or planned for letting between November 1997 and October 1999.

Exhibit IV-4: Environmental Documents Completed in Support of Project Let or Planned for Letting, November 1997 – October 1999

Environmental Document	Number Prepared	Percent	4(f) Analysis Included
Categorical Exclusion	90	89%	17
Environmental Assessment	8	8%	2
Environmental Impact Statement	3	3%	0
Total	**101**	**100%**	**19**

Source: MDT, DMG analysis

The categorical exclusions must provide enough analysis to demonstrate that no significant environmental impacts will result from a project. MDT produces different levels of documentation for categorical exclusions, as are shown in Exhibit IV-5 and described below:

Exhibit IV-5: Categorical Exclusion Documents Produced by Type and Cost November 1997 to October 1999

Type	Number	Percent	Costs			
			Minimum	Maximum	Average	Total
PCE	26	29%	<$1,000	$20,700	$2,000	$52,000
CE(c)	2	2%	$400	$400	$400	$800
CE (d)	41	46%	<$1,000	$42,800	$7,900	$323,900
RCE	4	4%	<$1,000	$63,900	$17,800	$71,200
CE/P4(f)	15	17%	$1,700	$82,300	$32,200	$483,000
RCE/P4(f)	1	1%	$44,900	$44,900	$44,900	$44,900
RPCE	1	1%	$3,600	$3,600	$3,600	$3,600
Totals	**90**	**100%**	**$400**	**$82,300**	**$10,883**	**$979,400**

Source: MDT, DMG analysis
Note 1: PCEs are Programmatic CEs, RCEs are Reevaluated CEs.

Programmatic categorical exclusions (PCEs). These are the simplest, cost an average of $2,000 to produce and account for 30 percent of all categorical exclusions produced. They must meet a standard list of criteria to satisfy NEPA regulations. MDT has developed a simple programmatic model, in partnership with FHWA, that uses a checklist to identify projects that meet these requirements.

Categorical Exclusion (c). Federal regulations have also identified another very limited list of projects, listed under CFR 771.117(c), which by their very nature, normally do not require further analysis, and have minimal costs. Less than 3 percent of projects fall into this category.

Categorical Exclusion (d). The majority of projects, some 66 percent, require supplemental documentation to support a "no significant impact" determination. These are sometimes referred to as (d) actions, because they are referenced from CFR 771.117(d). The cost to produce a (d) action varies depending on the issues addressed, and can range from less than $1,000 to over $40,000, and even more when a 4(f) analysis is required.

There are two benefits to project schedule and cost when impacts require categorical exclusion as opposed to an Environmental Assessment (EA) or an Environmental Impact Statement (EIS). First, a categorical exclusion approval only requires review from FHWA, and no public circulation period is mandated. Second, the categorical exclusion only requires documenting potential environmental impacts, while the other levels of environmental documentation have mandated formats that must address all aspects of the environment, regardless of the existence of significant impacts.

The Environmental Services Unit produces a document that will address all environmental contingencies. The primary guidance document is a compilation of federal and state regulations that offers little specific direction on the level of detail. The approach taken by the Environmental Services Unit is that, since MDT must depend on the FHWA and other agencies for approvals, it is better to provide more, rather then less information, to guarantee project approval. The results show that this approach has worked. To date, MDT has been very successful in obtaining FHWA concurrence on documents.

The rules for preparation of an EIS are quite clear. If the proposed project will result in significant environmental impacts, an EIS must be prepared. Since the cost and time line for preparation of an EIS is high, they are only prepared when regulations allow for no other option.

The rules for development of an EA allow for some flexibility. Technically the primary purpose of an EA is to help FHWA and MDT decide if an EIS is needed. In reality, that is already known prior to starting preparation of the document. If significant impacts are anticipated, an EIS is prepared from the start so resources are not wasted. However, MDT has used the EA to evaluate project alternatives, or insure that public involvement takes place. In these situations, nothing in the regulations precludes preparing a Categorical Exclusion (CE) in lieu of the EA.

Although a CE could be used more effectively than an EA to manage the environmental process, there may be some limited circumstances when an EA is necessary. In these situations, an EA can be selected as the proper document to satisfy concerns. However, the FHWA Technical Advisory Committee has stated that EA analyses must be concise, at no more than 15 pages; the Environmental Services Unit has been producing EAs with page counts more on the order of EISs, greater than 100 pages.

c. MDT's environmental document review process has many handoffs.

- **Evidence.**

  All documents, regardless of their type, go through an extensive MDT internal review by the Engineering Bureau of the Environmental Services Unit, and receive approval of the Bureau Chief before being transmitted to FHWA for final concurrence. This review begins with the District Project Engineers and is followed by the Bureau Chief. The documents are then circulated throughout MDT for further analysis and comment. The Engineering Service Bureau then reevaluates these comments and the review process is repeated within the bureau. Only after the Bureau Chief is satisfied the document is adequate, is it sent to FHWA for approval. The Bureau Chief is the final measure of quality for MDT documents. Consultant prepared documents must also go through this extensive review. Our interview results indicate that many involved in the process perceive the review process as adding little value.

d. Consultants are assigned a significant amount of environmental assessments and document preparation.

- **Evidence.**

  MDT staff rely heavily on consultants to deliver a significant amount of environmental work required by the current program. Consultants are typically assigned the most complex projects. The Detailed Ledger indicates $1.1 million out of $1.4 million spent for preliminary engineering environmental functions between 11/97 and 10/99 was for consultants. In general, consultants prepare all EISs, EAs, and most complex CEs. It is estimated that consultants prepare approximately 30 percent of all NEPA environmental documents and numerous resource impact assessment reports.

  The Environmental Services Unit is responsible for the quality of consultant prepared documents and spends a substantial amount of time training consultants and reviewing documents. There is no data available to quantify how much time or money MDT spends on quality assurance of consultant environmental work. Currently the only guidance given to consultants is a

compilation of federal and other regulations. There is no documented MDT guidance for this work, which is managed on a project-by-project basis. This leads to inconsistency and an unpredictable end product.

4. What Are the Requirements for Timely Public Involvement Input for Preconstruction Projects, and Are They Being Met?

a. MDT has developed a Public Involvement Handbook for project development.

- **Evidence.**

  Presently there are no mandatory prescribed requirements for public involvement during preconstruction. Federal regulations encourage early coordination with appropriate agencies and the public, but there is nothing legally required unless an EA or an EIS is being prepared for a project. In those situations, hearing requirements are in place and public notification and circulation of the document is prescribed. On the vast majority of projects where these kinds of documents are unnecessary nothing is required.

  In some cases where it becomes apparent a project may have some associated controversy, an EA will be selected as the environmental document primarily for the mandated public review required. In these cases the amount and type of public involvement is subject to the decision of the District Administrator.

  Federal guidelines have identified early public involvement as critical to satisfactory completion of environmental analysis and documentation for all projects. Opportunities for public input may begin during the planning phase to identify potential difficulties at the earliest possible time. MDT has developed a Public Involvement Handbook in response to establish identified procedures for public involvement, including development of a Public Involvement Plan.

5. What Are the Requirements for Resource Agency Input for Preconstruction Projects, and Are They Creating a Time Variable Outside of MDT Control?

a. Resource agencies create a time variable outside of MDT's project management control.

- **Evidence.**

  Permits from regulatory agencies are typically required on less than half of MDT projects. MDT has no direct control over when the permits are granted. MDT needs to be able to predict estimated turn around time and

build that into project schedules. Failure to obtain permits can delay projects' ready dates and result in changes to the project letting schedule. Our analysis found that 17 percent of letting schedule delays were due to not having the required permits or environmental documents approved. Interview results indicate that MDT has been proactive in working with resource agencies to identify opportunities for reducing the turn around time for permit requests.

The Environmental Services Unit is responsible for communicating and responding to resource agencies to secure any permits that are required during the preconstruction process. This responsibility is in addition to the preparation of environmental documents identified earlier. Permit acquisition is spread across the bureaus within the Environmental Services Unit, and assigned to numerous individuals. Permits are dealt with on a project-by-project basis. MDT does not have any documented guidance to provide consistency in permit applications. Interviews indicate that on several occasions permit applications submitted by MDT and its consultants have been incomplete, requiring supplemental information before being processed.

In addition to the permitting process, MDT must also rely on resource agencies to provide much of the baseline resource data to support environmental impact assessments. In addition to the lack of sufficient staff available at the resource agencies, these agencies indicate they cannot always be responsive because they have other priorities for people that must do the work, or there simply is not adequate baseline data currently available. Both state and federal agencies have identified this problem. Without this data, it is almost impossible for MDT to accomplish an assessment of impacts in a timely manner.

b. MDT management has provided leadership and supported initiatives with state and federal resource agencies to improve the efficiency and maintain the quality of the environmental process.

- **Evidence.**

  MDT executive management has made a commitment to address environmental issues as an integral part of project development. This commitment is supported by the Federal Highway Administration. Following is a list of MDT initiatives aimed at strengthening the working relationship with resource agencies and improving the timeliness and efficiency of the environmental process:

  – The Resources Bureau of the Environmental Services Unit introduced Activity 700 to PMS. This requires preliminary bridge plans be sent to resource agencies during the Survey Phase.

- An Interagency Wetland Committee chaired by MDT personnel evaluates off-site mitigation proposals early in the Design Phase. This committee, established by MDT, encourages involvement from multiple agencies on wetland mitigation proposals.
- The U.S. Fish & Wildlife Service performs early site reviews on bridge projects, before bridge siting takes place.
- A Fish Protection Task Force, made up of MDT and Montana Fish Wildlife and Parks personnel, has documented proper procedures for work in fish bearing streams. This has resulted in a series of improvement initiatives.
- Districts hold annual program review meetings with resource agencies to obtain early project input.
- A facilitated Stormwater Permit process has been developed by MDT in cooperation with the Department of Environmental Quality (DEQ).
- MDT has funded several positions in resource agencies to ensure that permits are not delayed due to staffing levels. This has already been implemented at the Corps of Engineers, the U.S. Fish and Wildlife Service, and Montana Department of Fish, Wildlife and Parks. MDT is currently in discussion with the DEQ to fund a position there.
- Shoreline Protection Act (SPA) construction permit enforcement issues are facilitated by Montana Department of Fish, Wildlife and Parks to provide in-field, one-on-one inspections.

I. Recommendations:

Recommendation IV-1. Integrate project management responsibilities for environmental activities into the entire project design management process.

- **As part of establishing strong matrix management for preconstruction project delivery (see Recommendation III-1), make project managers responsible for the schedule and cost of environmental activities on projects.**
- **Increase environmental engineers' accountability to project managers for schedule/ activity completion.**
- **Use environmental expertise as a resource to participate in design decisions.**
- **Establish achievable durations for environmental activities.**

This recommendation would be best addressed as part of implementing Recommendation III-1. The major intent is to ensure that the project manager is managing all aspects of project delivery and is actively engaged in ensuring that the environmental activities start on time and can be completed on time. Project managers need to have ownership for these

activities. Environmental engineers need to be accountable to the project managers for schedule and cost. The Environmental Services Unit's line management would be responsible for quality and MDT's environmental expertise.

Implementation Step:

1. Address as part of Recommendations III-1 and III-2.

Recommendation IV-2. Ensure that PMS (or its replacement) is useful to, and is used by, the Environmental Services Unit for managing environmental activities.

- **Develop more accurate duration and work standards for environmental activities.**
- **Institutionalize the use of PMS data as a tool by environmental engineers.**
- **Address environmental process requirements as part of Recommendation III-5.**

PMS does not provide much value at present for managing the environmental activities. In the near term more accurate schedule and work standards are required and need to be used to manage environmental activities.

Implementation Steps:

1. Establish more accurate work standards for PMS.
2. Use the work standards.
3. Address requirements for information to manage environmental activities as part of recommendation III-5.

Recommendation IV-3. Make process improvements to the environmental activities in the preconstruction project delivery process that include:

- **Identifying key environmental issues early during Preliminary Field Review (PFR) so they can be responded to earlier without delaying the project.**
- **Beginning environmental activities earlier as specified in the new consultant design procedures.**
- **Providing applicable resource agencies with opportunity for early input.**
- **Including resource agencies where appropriate as members of the project team for projects that will be developed using a project team (see Recommendation III-4).**

This recommendation involves improving the environmental process work flow to begin environmental activities sooner. It should be implemented as part of the work required to define new business rules prior to implementation of a new preconstruction management system.

This recommendation is intended to involve resource agencies and other key stakeholders on project teams for complex projects. The purpose of this involvement is to develop design solutions that are responsive to resource agency concerns, that will then receive quicker regulatory approval, and strengthen MDT's environmental ethic. While involving more work early on, the intent is that through partnering there will be greater buy-in and support for the design solution.

Implementation Steps:

1. Conduct work session with applicable staff to identify process improvements that will enable MDT to begin environmental activities earlier.
2. Prepare new work process flows and review with MDT employees and other agencies including selected resource agencies.
3. Incorporate new process into work performed to implement other recommendations.
4. Establish procedures for identifying projects to be developed using a project team.
5. Establish project team procedures and tools.

Recommendation IV-4. Standardize and simplify MDT's procedures for developing and approving environmental documents.

- **Delegate signing and approval of Categorical Exclusions to the District Environmental Project Engineers in the Environmental Services Unit.**
- **Develop MDT standardized formats for both MDT and consultant produced environmental documents.**
- **Establish MDT guidelines for undertaking Environmental Assessments. If more detailed analysis is needed do it as part of a Categorical Exclusion document.**
- **Develop standardized procedures and report formats for resource analysis reports.**
- **Develop a permit checklist for standardizing permit applications.**

This recommendation is designed to increase consistency and reduce the work required to prepare environmental documents. In addition, it should include establishing procedures through which MDT can reduce the number of environmental assessments prepared.

Implementation Steps:

1. Prepare standardized procedures.
2. Obtain employee support and buy in.
3. Obtain support and buy in as applicable from resource agencies.

Recommendation IV-5. Focus environmental engineers' work on providing support to preconstruction project managers.

- **Use environmental expertise as a resource to participate in design decisions.**
- **Offer cross-training to increase MDT engineers' understanding of environmental issues and cost-effective design solutions that can avoid, minimize, and mitigate impacts.**

This recommendation should be implemented as part of the recommendation to move toward a strong matrix management approach for project design. The intent is that the environmental engineers' work is oriented to provide project delivery support to the project manager. They would have a soft report to each project manager for the cost and schedule of the work performed on projects. They would be accountable to their line manager and the Environmental Services Unit for the quality of the environmental process. In addition, through training and other initiatives MDT project managers would increase their understanding and ability to address environmental issues through the design process.

Implementation Steps:

1. Address roles and responsibilities as part of Recommendation III-1.
2. Environmental Services Unit would provide coaching and resources to help project managers be successful in meeting environmental design objectives.

Recommendation IV-6. Continue to work with state and federal regulatory agencies to:

- **Increase the efficiency and speed with which regulatory requirements are met without compromising MDT's commitment to environmental protection.**
- **Improve external communication with resource agencies to encourage better understanding of respective agency needs and concerns.**

This recommendation recognizes and endorses the multiple initiatives that MDT has underway to improve the efficiency and effectiveness of coordination with state and federal resource agencies.

Implementation Steps:

1. List the initiatives underway.
2. Establish timelines for their implementation.
3. Monitor and report implementation status to senior management, resource agencies, and MDT employees.
4. Evaluate outcome from the initiatives.

V. Preconstruction Survey

■

A. Introduction

This section assesses MDT's performance in preconstruction survey delivery.

1. Background

The preconstruction survey function is comprised of all activities that determine boundaries and locations used for highway construction, right-of-way determination, and bridge/structure placement. District survey teams perform preconstruction survey duties. In most districts, survey teams split their time between preconstruction survey and construction survey.

1. Audit Questions

The following audit questions are answered in this section:

- Are preconstruction surveys delivered on budget?
- Are preconstruction surveys delivered on schedule?
- Does preconstruction survey have effective management, organization, and resources?

2. Approach

The approach taken to assess the performance of MDT's preconstruction survey function included the following:

- Interviews were conducted with preconstruction survey "customers" at headquarters and in each district. This included designers, design supervisors, Area Engineers, and Engineering Services Supervisors.
- Interviews were conducted with survey management and staff in all five districts. This included survey technicians, survey supervisors, and construction engineers.
- Analysis was completed of budget performance, late activities, and schedule performance of preconstruction survey for projects let in federal fiscal years 1998 and 1999 (the data set analyzed in Section III).

B. Findings and Conclusions

1. Are Preconstruction Surveys Delivered on Budget?

a. Preconstruction survey is significantly over budget. For 108 federal aid projects let between 1997 and 1998, actual labor costs were 96.6 percent greater than planned.

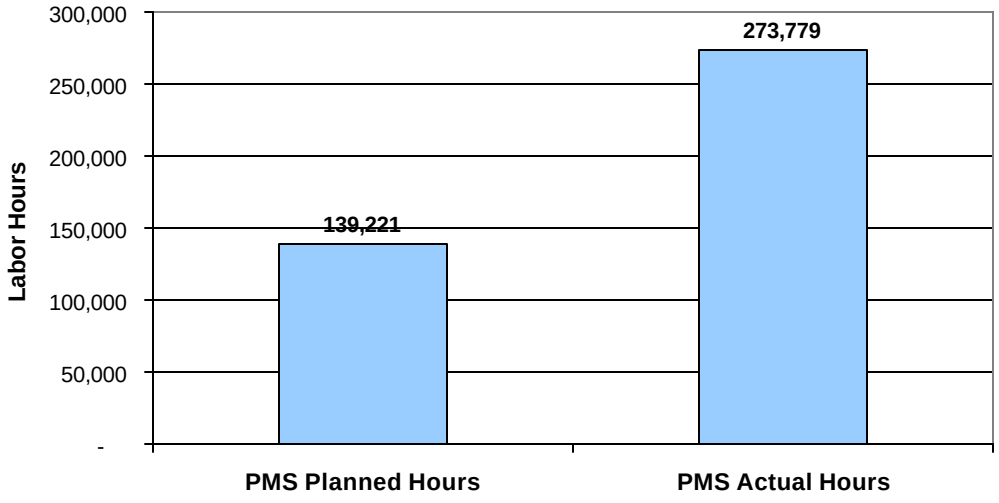
- **Measurement.**

  To measure budget performance, data from PMS and the Detailed Ledger accounting system were used to assess whether survey activities were completed within planned budget amounts. Data was analyzed from 108 projects advertised between 11/1/97 and 9/30/99.

- **Evidence.**

  Exhibit V-I below summarizes the findings with regard to preconstruction survey budget performance.

Exhibit V-1
Survey - Planned versus Actual Labor Hours
108 Federal Aid Projects Let in 1997/98 and 1998/99



Source: Derived from PMS and the Detailed Ledger

Actual preconstruction survey labor hours greatly exceed the planned labor hours budgeted in PMS. This result suggests that the planning values used in PMS need to be reevaluated and that management needs to be aware that preconstruction survey is requiring significantly more labor hours than MDT has been anticipating.

Actual labor costs were 96.6 percent greater than planned. Actual survey labor costs totaled over $3.4 million. In addition, MDT has been spending approximately $500,000 per year on outsourcing preconstruction surveys, over the past three years, to help deliver the larger TEA-21 program.

b. There is little project level accountability for, and management of, preconstruction survey budgets.

- **Evidence.**

  There is little project level accountability for preconstruction budgets within MDT's current project management structure. In addition, the audit team found little evidence that preconstruction survey managers monitor/track preconstruction survey budgets. This finding is consistent with other areas of preconstruction discussed in this report in that the management controls, reporting, and accountability structure for preconstruction are focused on schedule with less attention to budget.

  In the preconstruction survey area, the problem is magnified because no one is directly accountable for the budget for it. The Area Engineers and Engineering Services Supervisors, who are acting as project managers do not have the authority over survey since it falls organizationally under the Construction Engineer (except in Billings). The Construction Engineer is focused on construction and is held accountable for construction budgets.

- **Considerations.**

  – **Survey technology has changed.** A factor that may explain some of this variance in planned versus actual labor hours is that survey technology has changed in recent years. Interviews of surveyors reveal a perception that preconstruction survey is now more labor intensive in terms of pre-field work and actual data collection. This points to a need to insure that the new technology is being used as efficiently as possible. However, the data gathered feeds directly into the computer-aided design program used by MDT. Increased survey costs can result in a significant savings in design time. Designers agree that new survey technology has increased their productivity by reducing the time needed to transfer survey coordinates into the design programs.

2. Are Preconstruction Surveys Delivered on Schedule?

a. For many projects, surveys are not completed on schedule, resulting in ready date changes. Late surveys are a major factor in projects not being delivered on time.

- **Measurement.**

  PMS is a constantly updated program that overwrites the original ready date, once a ready date is changed. For that reason, it is not possible to perform schedule analysis of planned versus actual completion for preconstruction surveys. However, because survey takes place at an early stage in the preconstruction process, it is possible to draw conclusions about survey schedule performance from Phase Review meeting notes. In Section III, Phase Review meeting records of which activities had ready dates changed, and by how long, were compiled. Exhibit III-5 shows the ten most frequently late PMS activities recorded at Survey Phase review meetings from 1/5/99 to 10/7/99.

- **Evidence.**

  Analysis of the ten most frequently late PMS activities from Survey Phase shows that the top five most frequently late activities were road design activities related to the scope of work and preliminary field review reports. Interviews with Helena Area Engineers and district Engineering Services Supervisors confirm that these activities are late because surveys are late. In fact, late surveys have a ripple effect that can prevent a preconstruction design from getting back on schedule.

  In December and January of 1999, the Federal Highway Administration (FHWA) interviewed district and headquarters personnel to identify delivery bottlenecks and develop solutions to relieving them. Preconstruction surveying was repeatedly identified over the course of the interviews as an impediment to project delivery. Interviews undertaken in Helena and in the districts for this audit support FHWA's findings.

3. Does Preconstruction Survey Have Effective Management, Organization and Resources?

a. Management controls and accountability structure for preconstruction survey need strengthening.

- **Measurement.**

  MDT's policies, procedures, and management controls were evaluated. This was supplemented by evaluation of how business is conducted in practice.

- **Evidence.**

  - **Managers of preconstruction survey do not use a budget to manage preconstruction survey delivery against at the program or individual project budget levels.** Costs of preconstruction survey have not been well controlled, as analysis earlier in this section has shown. Preconstruction survey needs improvements in monitoring and management accountability systems for project delivery through:

    - Establishing preliminary budgets for all projects, tracking, and reporting budget to actual expenditures.
    - Holding project managers and management accountable for preconstruction survey budget and schedule.

  - **Organizational reporting structure for preconstruction survey is not the most effective.** In most districts (all except Billings) crews doing preconstruction survey do not report to the person responsible for district preconstruction – the Engineering Services Supervisor. For Helena designed projects, the Area Engineers are even further removed – working survey requests through the Engineering Services Supervisors to get preconstruction surveys completed.

    In all districts, except Billings, survey crews report to and take direction from the Construction Engineer. Survey requests for district designed projects come from the Engineering Services Supervisor and survey requests for Helena designed projects come from Area Engineers, through the district Engineering Services Supervisor, and then on to the district Construction Engineer.

    The Construction Engineer's primary focus is on the delivery of construction projects. The intense nature of construction from spring through fall puts preconstruction survey in competition with construction survey. For this reason, most preconstruction survey takes place in the late fall, winter, and early spring. Given the importance of preconstruction survey in delivering projects on schedule, the current reporting and organization structure for preconstruction survey is not the most effective.

    The Billings district is somewhat unique when it comes to its organization of preconstruction survey. A few years ago Billings was significantly behind on its preconstruction surveys. To solve the problem, the district made changes to the organization of survey. Three Engineering Tech 3 surveyors were pulled away from construction survey and put in charge of three dedicated preconstruction survey crews. New staff were hired for survey

technical support on the three crews. The three dedicated preconstruction survey crews report directly to the Engineering Services Supervisor. The Engineering Services Supervisor and the District Administrator believe that the Billings district has made significant improvements in preconstruction survey under this structure.

- **Management has issued a policy directive in response to schedule concerns. However, this management directive to change preconstruction survey organization, policies and procedures has not been fully implemented.** MDT is well aware of the issues related to preconstruction surveying. Concern about late preconstruction surveys was heightened by the demands of the increased program under TEA-21. A memo from the Director to the five District Administrators in April 1999 stated:

  Tremendous progress has been made at the district offices through a heightened awareness of survey need and the use of term contracts to deliver. However, the March 30, 1999 Survey Phase Review identified the number of late surveys from the districts is on the rise. The problem in Helena headquarters has worsened due to the increase in workload and the lack of ability to hire and retain skilled staff. Also, the success in the districts has not come without a cost: in FY 1998 we spent nearly $500,000 on consultant surveys. Even with these efforts there are many challenges remaining…

  In the same memo a directive was issued, as follows:

  In order to meet the challenges TEA-21 presents us, the district offices are hereby directed to create a location crew consisting of a Professional Land Surveyor (PLS) and two surveying technicians. The Engineering and Highways Division will provide sufficient FTE. The duties of the location crew will include the following:

  1. *Ensure preconstruction surveys are delivered on time, accurate and with sufficient detail to produce quality designs. It is envisioned the districts' construction personnel will continue to deliver the bulk of preconstruction surveying and to a lesser extent in the future, consultants. The location crew will also perform preconstruction surveys as needed.*
  2. *Pick up surveys during the construction season will be a top priority.*
  3. *Locating and tying section corners as needed for right-of-way.*

4. *Monumentation of right-of-way.*
5. *Any retracements required.*
6. *The location crew will function as each district's technical expert on surveying and surveying equipment.*
7. *Provide district survey training.*
8. *The crew will ensure consistent use of the State Plane Coordinate System at the district level.*

It is envisioned the Location Crew will function administratively out of the district offices, but will be under the technical supervision of the Helena headquarters surveying office. Top priority will be given to delivering preconstruction surveys.

The implementation target for this plan is July 1, 1999.

At the time of this audit, Missoula, Butte, Great Falls and Billings districts have hired registered land surveyors – leaving only Glendive without surveyors. However, the district location crews have not been fully implemented as intended in any of the districts. During audit interviews, district staff expressed difficulty in getting and filling the positions needed to fully implement the location crews. The registered land surveys do not have established crews in most of the districts and, in some cases, do not have regular offices established.

– **Technical/software and training issues may be affecting survey productivity.** New technology in preconstruction survey, such as the use of data collectors and global positioning system (GPS) has changed what is done and how it is done. The new methods involve pre-field work and significant technical knowledge. The benefit of the new methods is that they improve the quality and accuracy of preconstruction surveys and, most importantly for productivity, information gathered feeds directly into computer assisted design programs which reduces design time significantly.

While it is beyond the scope of this audit to examine technological/software and training issues related to survey, district interviews with survey staff revealed some consistent concerns that should be noted.

The following issues were raised:

- The current DOS-based data collector system is not compatible with Microstation software and therefore much editing is required.

- Editing is time consuming and the method is easily forgotten unless used all the time.
- Districts should have their own GPS receivers (currently there are four that must be signed out from Helena). Processing could be done in the districts (right now one person in Helena does the processing).
- A concern exists that some staff are not well trained in the new survey technology. Further, there is a learning curve and learned skills can become lost when switching from preconstruction survey back to construction survey work.

The full implementation of dedicated preconstruction location crews would resolve issues related to losing fluency with the technical aspects of preconstruction survey and training.

C. Recommendations

This section presents recommendations to enhance and improve preconstruction survey delivery based on the audit findings in this area.

Recommendation V-1. Establish management controls over schedule and cost for survey.

- **Establish work standards and budgets. Track and manage against schedules and budgets.**
- **Measure and report survey costs.**
- **Improve survey planning through accurate PMS planning values.**

These recommendations are designed to strengthen procedures and systems for preconstruction survey cost, scope, and schedule control. This will provide a mechanism for holding project managers and management accountable for cost, scope, and schedule variances.

Implementation Steps:

1. Implement procedures for establishing agreed scope, schedule, and budget that project managers will commit to meeting.
2. Update preconstruction survey planning values/dates and review feasibility of undertaking survey before federal agreement is established.

Recommendation V-2. Provide project managers the responsibility and the authority for preconstruction survey.

- **Hold project managers and management accountable for cost, scope, and schedule variances.**
- **Ensure project managers have authority and mechanisms to obtain survey resources where and when they are needed.**

These recommendations will strengthen management and accountability for preconstruction survey. In most districts, the current reporting structure provides those responsible for delivering design projects with no direct control over preconstruction survey crews. The intent of this recommendation is to provide the project manager with the option of using MDT or consultant services to meet the project delivery schedule.

Implementation Steps:

1. Design and implement accountability mechanisms.
2. Define procedures for reporting progress against scope, schedule, and budget, and control mechanisms for adjusting these.

Recommendation V-3. Expedite changes to the organization and reporting structure for preconstruction survey.

- **Fully implement planned changes to preconstruction survey organization, policies and procedures as specified in the Director's April 1999 memorandum.**
- **In addition, have planned preconstruction survey location crews report to district Engineering Services Supervisor.**

This recommendation will fully implement the planned changes to preconstruction survey organization, policies, and procedures. The planned preconstruction survey location crews would be most effective if they reported to the district Engineering Services Supervisors. This is consistent with strengthening the role of preconstruction project managers, making them responsible for budget, schedule, scope and quality.

Implementation Steps:

1. Complete hiring of registered land surveyors in all districts.
2. Make organizational change so that planned preconstruction survey location crews report to district Engineering Services Supervisor.

Recommendation V-4. Evaluate process, technology, and procedures used for survey. Issues to address include:

- **Data collector system integration with design software.**
- **Training and equipment in the district to perform preconstruction survey.**

This recommendation will identify opportunities to improve preconstruction survey efficiency by ensuring that the processes, technology, and procedures used are compatible and state-of-the-art and that staff are adequately trained in their use.

Implementation Steps:

1. Undertake improvement analysis to evaluate process, technology, and procedures used for survey.

Agency Response

Montana Department of Transportation
Helena, Montana 59620-1001

Memorandum

To: Scott Seacat, Legislative Auditor
Legislative Audit Division

From: Marv Dye, Director

Date: May 24, 2000

Subject: Response to Preconstruction Performance Audit Recommendations

Below are our comments in response to the recommendations put forth by Dye Management in the document entitled *Performance Audit of Preconstruction Delivery*. If you have any questions, please contact me at 444-6201.

Recommendation II-1
Establish a set of strategic department-wide management objectives, performance measures, and monthly reports for project delivery.

Response
Concur. MDT, in its current Strategic Initiative process, will address all items outlined concerning reports, performance measures and providing accountability. It is MDT's intention to tie objectives created with individual employee performance plans where applicable.

Recommendation II-2
Improve the project delivery planning and management level reporting systems.

Response
Concur. To achieve this recommendation, MDT will need to develop an IT plan that ties essential information from the Project Management System, Financial Management, and Fiscal Programming, or develop one comprehensive system similar

to Program and Project Management Systems utilized by other state DOTs. To accomplish this, MDT will require a concerted effort across several divisional boundaries outside the scope of this report (Planning and Administration) to get agreement. Delivery of such a comprehensive information system could coincide with the current proposed overhaul of the Project Management System. Currently utilized systems would be discontinued at the time of implementation. In either course of action outlined, a single point of output should be established for analysis and reports.

Recommendation III-1

Elevate the importance of project management by establishing a strong matrix management approach for project delivery.

Response

Concur with concept of elevating Project Management and also concur with change in management approach. However, MDT does not concur that a strong matrix is the only approach viable to accomplish the recommendation. MDT wishes to evaluate several management methods including the strong matrix for best fit. Challenges will occur when authority to move in a stronger project management approach is withheld due to conflicting or outdated job authority. MDT may have to reorganize its organizational structure with assigned duties and job requirements from the area engineer equivalent positions up to the head of preconstruction. Implementation will take several years to accommodate.

Recommendation III-2

Strengthen project management culture.

Response

Concur. Through current strategic planning process these will be accomplished. Others are currently being accommodated as the training needs arise.

Recommendation III-3

Address bottlenecks arising from traffic engineering review function currently performed in Helena. Assess potential for shifting some design decisions to project managers.

Response

Concur. Current reorganization of the Traffic and Safety functions into one Bureau will provide MDT the ability to assess the business processes surrounding these functions. Implementation is underway.

Recommendation III-4
For complex projects, prior to preliminary field review, establish a project team approach for project delivery involving all applicable MDT disciplines, and external agency and organization representatives.

Response
Concur. MDT recognizes that the ability to shepherd large controversial or complex projects through the design process is increasingly difficult. To address this issue adequately, MDT will need to develop basic policy and procedure for this type of operation as well as develop training in interdisciplinary team dynamics. Implementation would have to coincide with development of a management model for project managers. MDT has done this with other projects in the past with success.

Recommendation III-5
Strengthen the procedures and tools that support project management.

Response
Concur. PMS manual and associated documents related to this process are continuously updated as changes are warranted. The possibility of putting this online is being explored. MDT recognizes that continuous process evaluation is essential and has stated it as a strategic initiative within its strategic plan.

Recommendation III-6
Improve the monitoring and management accountability systems for project delivery.

Response
Concur. This recommendation will be accomplished through II-1 and II-2.

Recommendation III-7
Prepare for and implement a new project management system.

Response
Concur. MDT recognizes that a new PMS is essential to its long-term viability in this area and has budgeted monies for its development. Outcomes of recommendations of this audit will influence the design and time 'til implementation.

Recommendation IV-1
Integrate project management responsibilities for environmental activities into the entire project design management process.

Response
Concur. MDT agrees with this recommendation but the exact design of the "enhanced project management" concept has yet to be determined. When the final decision is made on how MDT will perform project management, the concept of environmental project engineers reporting to a project team or project manager will be implemented.

Recommendation IV-2
Ensure that PMS is useful to, and is used by, the Environmental Services Unit for managing environmental activities.

Response
Concur. This work was initiated and the first phase has been completed. New activities were sent to Project Management at the end of April 2000. MDT continues to do this as needs arise as a part of a living process.

Recommendation IV-3
Make process improvements to the environmental activities in the preconstruction project delivery process.

Response
Concur. Some of this work has already been completed. The Categorical Exclusion will now be completed at the preliminary field review stage. The consultant design process will now be the same process used in-house. We continue to work on new methods to get regulatory agencies involved as soon as possible. And, we have had resource agency personnel be part of some field review teams. We continue to work on all suggestions and recommendations. Process improvement is always part of out yearly goals.

Recommendation IV-4

Standardize and simplify MDT's procedures for developing and approving environmental documents.

Response
Concur. Much of this work was already done before the audit. We are presently in the process of further simplifying the categorical exclusion process. This should be completed by June 1, 2000. Whenever possible we avoid the necessity of doing an environmental assessment or environmental impact statement. Guidelines for these documents are presently being rewritten by FHWA. Proposed rulemaking is due later this month. We will adhere to the new guidelines as they are adopted in the CFRs.

Recommendation IV-5
Focus environmental engineers work on providing support to preconstruction project managers.

Response
Concur. As MDT moves forward with new project management concepts, we will do whatever it takes to make MDT successful. And, we will be accountable for environmental activities.

Recommendation IV-6
Continue to work with state and federal regulatory agencies.

Response
Concur. We presently have MOAs with the US Fish and Wildlife Service and US Corps of Engineers. We are in the process of establishing a Memorandum of Agreement (MOA) with DEQ. And, we are just beginning to discuss a MOA with FWP. The intention of these agreements is to facilitate timely project delivery and environmental protection.

Recommendation V-1
Establish management controls over schedule and cost for survey.

Response
Concur. With the anticipated establishment of District survey, we foresee that management controls will be enhanced.

Recommendation V-2
Provide project managers the responsibility and the authority for preconstruction survey.

Response
Concur. FTE are being requested through the budget process. And, when the final decision is made on how we will perform project management, mechanisms and authority for delivering survey will happen.

Recommendation V-3
Expedite changes to the organization and reporting structure for preconstruction survey.

Response
Concur.

Recommendation V-4
Evaluate process, technology, and procedure used for survey.

Response
Concur. This is being addressed. A task force is being put together. Training and equipment will be based on the recommendations of the task force.

Appointed and Administrative Officials

Appointed and Administrative Officials

Montana Transportation Commission

		term expires in January
Thorm Forseth, Chairman	Billings	2001
Dan Larson	Libby	2003
Patricia Abelin	Bozeman	2001
Robert McKenna	Helena	2001
Nancy Espy	Broadus	2003

Aeronautics Board			
	Ron Mercer, Chairman	Helena	2001
	Byron Bayers	Twin Bridges	2001
	Fred Booth	Fort Benton	2001
	Will Metz	Laurel	2001
	Douglas Freeman	Hardin	2001
	Joann Eisenzimer	Cascade	2003
	John Rabenberg	Fort Peck	2003
	Craig Denney	Billings	2003
	Bob Palmersheim	Fromberg	2003

Department of Transportation

Administrative Officials

Marvin Dye, Director
Jim Currie, Deputy Director
Russ McDonald, Administrator, Human Resources
Tim Reardon, Chief Counsel, Legal Services
Bill Salisbury, Administrator, Administration Division
Mike Ferguson, Administrator, Aeronautics Division
Gary Gilmore, Administrator, Engineering Division
John Blacker, Administrator, Maintenance Division
Drew Livesay, Acting Administrator, Motor Carrier Services Division
Patricia Saindon, Administrator, Transportation Planning Division

District Administrators

Jason Giard, Butte District
Bruce Barrett, Billings District
Bill McChesney, Glendive District
Michael Johnson, Great Falls District
Loran Frazier, Missoula District